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# Free-Jet Feasibility Study of a Thermal Acoustic Shield Concept for AST/VCE Application--Dual Stream Nozzles

Comprehensive Data Report

Volume II

Laser Velocimeter and Suppressor  
Base Pressure Data

by

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COMPREHENSIVE DATA REPORT. VOLUME 2: LASER  
VELOCIMETER AND SUPPRESSOR. CASE (General G3/71



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16. Abstract  Acoustic and diagnostic data that were obtained to determine the influence of selected geometric and aerodynamic flow variables of coannular nozzles with thermal acoustic shields are summarized in this comprehensive data report. A total of 136 static and simulated flight acoustic test points were conducted with 9 scale-model nozzles. The tested nozzles included baseline (unshielded), 180° shielded, and 360° shielded dual flow coannular plug configurations. The baseline configurations include a high radius ratio unsuppressed coannular plug nozzle and a coannular plug nozzle and a coannular plug nozzle with a 20-chute outer stream suppressor. The tests were conducted at nozzle temperatures and pressures typical of operating conditions of variable cycle engine. Aerodynamic laser velocimeter measurements were made for four selected plumes. In addition, static pressure data in the chute base region of the suppressor configurations were obtained to assess the influence of the shield stream on the suppressor base drag.					
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## 5.0 LASER VELOCIMETER TESTS

Mean and turbulent velocity measurements were conducted on 4 different plumes of selected nozzle configurations using the laser velocimeter (LV). Aerodynamic conditions that define the LV test points are presented in Subsection 5.1. The scope of LV testing on each of the selected plumes is presented pictorially in Subsection 5.2. The required traverse calibration data are provided in Subsection 5.3. Finally, copies of the mean velocity traces obtained on X-Y plotters during the tests and tabulations that describe the LV position, type of traverse and histogram measured mean and turbulent velocities, are presented in Subsection 5.4.

A photograph of the assembled 20-shallow-chute suppressor configuration with 180° shield taken during the LV test is shown in Figure 5.1.

### 5.1 Summary of LV Tests and Aerodynamic Conditions of Test Points

The aerodynamic flow conditions of the LV test points are summarized in Table 5-1. The test points are made up of:

- o One static and one simulated flight point (LV Test Points 1 and 2) of Configuration TAS-11 (unsuppressed coannular plug nozzle with 180° shield of 1" thickness operating with  $V^S/V^O \approx 0.63$ ) at a typical takeoff aerodynamic flow condition.

- o One static and one simulated flight point (LV Test Points 3 and 4) of Configuration TAS-16 (20-shallow-chute coannular plug nozzle with 180° shield of 1" thickness, operating with  $V^S/V^O \approx 0.64$ ) at a typical takeoff aerodynamic flow condition.

### 5.2 Scope of LV Measurement on the Selected Plumes

The scope of the axial and radial mean velocity profiles and the number of histograms associated with each of these traverses are provided pictorially, for each of the LV test points, in Figures 5.2 through 5.5. For easy cross reference, the following additional information is provided on each of these figures:



Figure 5.1. Photograph Showing the Laser Velocimeter (LV) System and TAS-16 Nozzle Setup for Plume Survey in Anechoic Jet Noise Facility.

Table 5-1. Aerodynamic Conditions and Scope of Laser Velocimeter Tests on Unsuppressed and Suppressed Coannular Plug Nozzle with Partial Thermal Acoustic Shield.

CONFIG.	DESCRIPTION OF CONFIGURATION	LV TEST POINT	MATCH. ACoust. TEST POINT	V <sub>ac</sub> (fps)	INNER STREAM			OUTER STREAM			SHIELD STREAM			MIXED STREAM			v <sup>i</sup> /v <sup>o</sup>	v <sup>s</sup> /v <sup>o</sup>	SCOPE OF LV TESTS
					p <sub>r</sub> <sup>i</sup>	T <sub>T</sub> <sup>i</sup> (°R)	v <sup>i</sup> (fps)	p <sub>r</sub> <sup>o</sup>	T <sub>T</sub> <sup>o</sup> (°R)	v <sup>o</sup> (fps)	p <sub>r</sub> <sup>s</sup>	T <sub>T</sub> <sup>s</sup> (°R)	v <sup>s</sup> (fps)	p <sub>r</sub> <sup>mix</sup>	T <sub>T</sub> <sup>mix</sup> (°R)	v <sup>mix</sup> (fps)			
TAS-11	Unsuppressed Coannular Plug Nozzle with 180° TAS	1	1139	0	2.28	905	1512	3.01	1632	2314	1.49	1617	1447	2.36	1533	2011	0.65	0.63	FIGURE 1
		2	1140	400	2.28	943	1540	3.02	1642	2325	1.51	1607	1473	2.37	1545	2025	0.66	0.63	FIGURE 2
TAS-16	20 Shallow-Chute Coannular Plug Nozzle with 180° TAS	3	1639	0	2.29	901	1510	3.04	1651	2338	1.53	1628	1497	2.34	1550	2012	0.64	0.64	FIGURE 3
		4	1640	400	2.31	899	1516	3.07	1672	2362	1.56	1629	1537	2.36	1563	2032	0.64	0.65	FIGURE 4

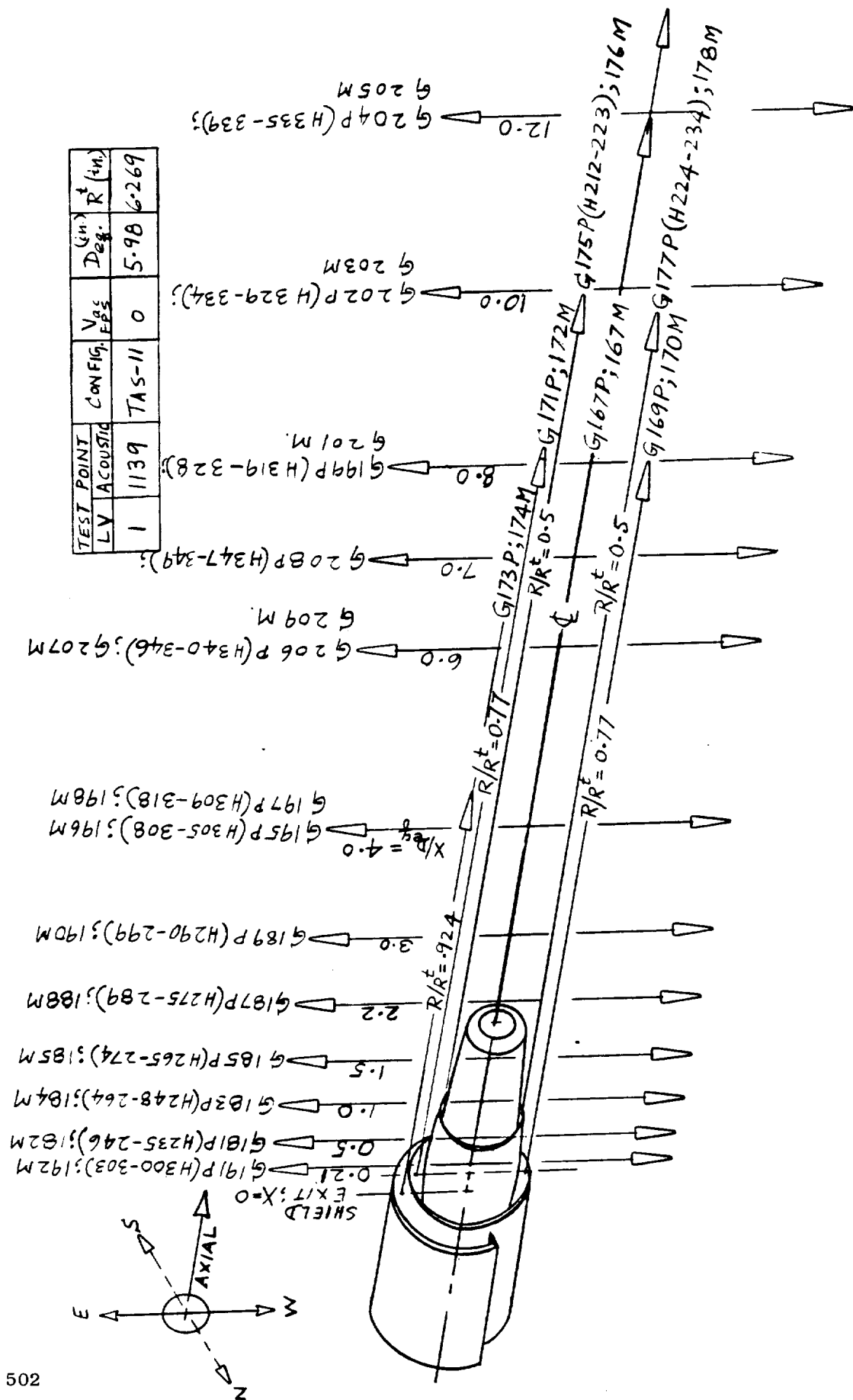


Figure 5.2 Pictorial Representation of Scope of LV Measurement on Configuration TAS-11 for LV Test Point 1. (Matching Acoustic Test Point 1139, Static, Takeoff Condition)



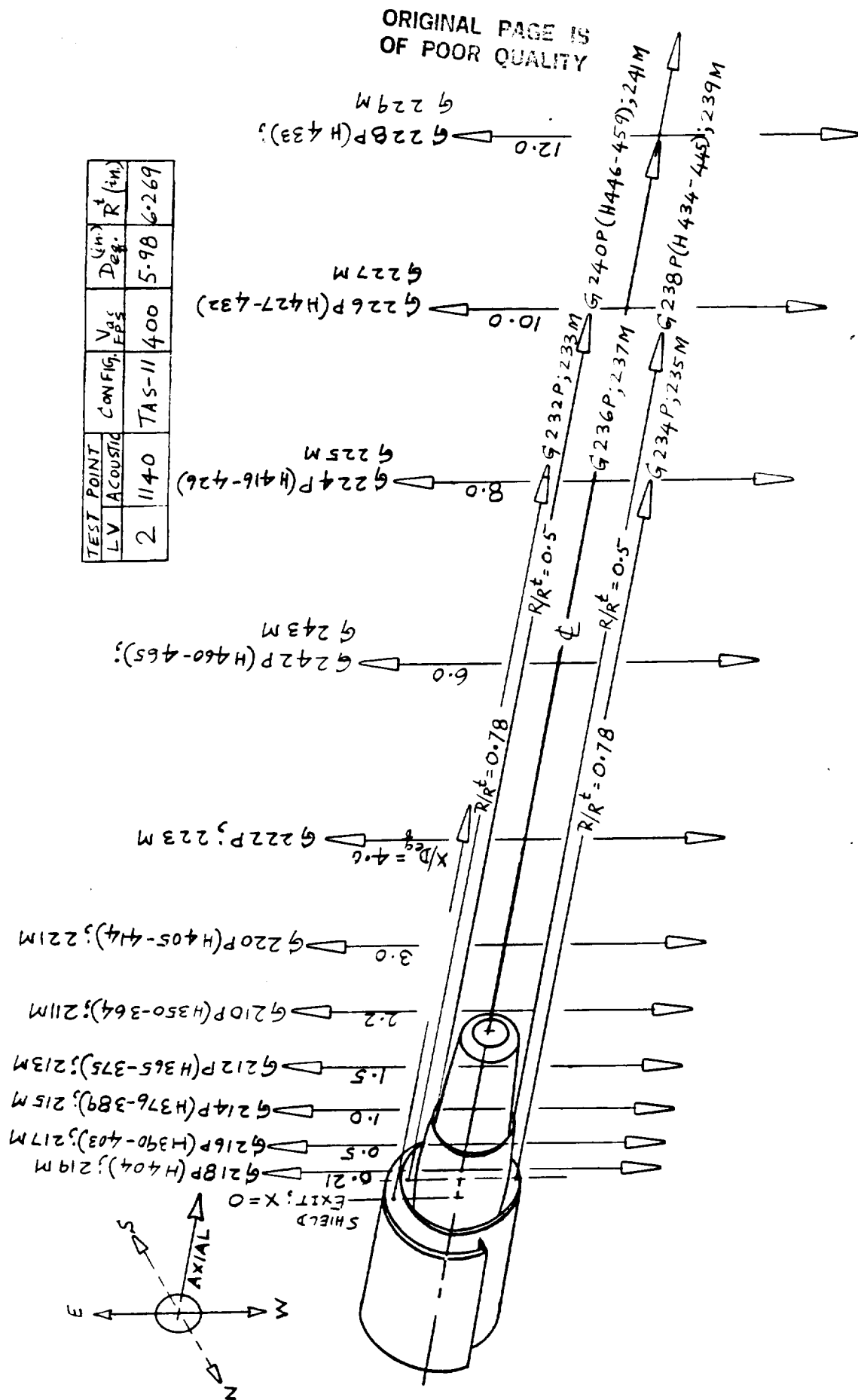


Figure 5.3 Pictorial Representation of Scope of LV Measurement on Configuration TAS-11 for LV Test Point 2. (Matching Acoustic Test Point 1140, Simulated Flight, Takeoff Condition).

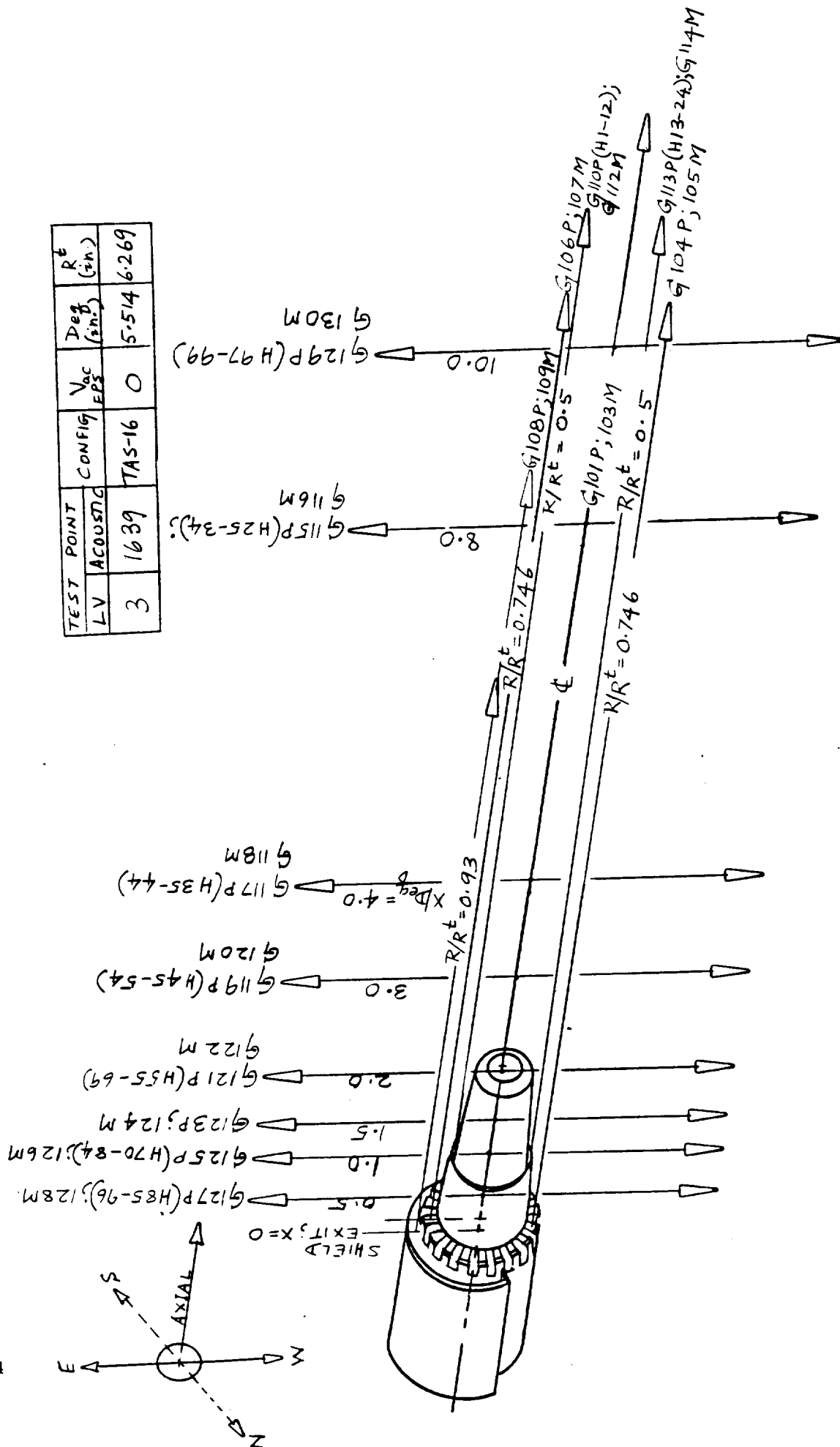


Figure 5.4 Pictorial Representation of Scope of LV Measurement on Configuration TAS-16 for LV Test Point 3. (Matching Acoustic Test Point 1639, Static, Takeoff Condition).



- o Location of  $X=0$  (reference) along the nozzle axis.
- o Axial location of each of the E-W radial mean velocity traverses as indicated by an  $X/D_{eq}$  value ( $D_{eq}$  is the equivalent conic nozzle diameter of the baseline nozzle).
- o Radial location  $R$  of each of the axial mean velocity traces as indicated by an  $R/R^t$  value ( $R^t$  is the reference outer radius of the shield nozzle).
- o Identification of the mean velocity traces obtained on an X-Y plotter by specified plot identification numbers. For example, G-242P and G243M. These numbers appear on the copies of the traces that are presented in Subsection 5.4. They also are cross-referenced in the data tables of Subsection 5.4. The letters P or M that appear in the lot identification number denote, respectively, the pen or minihistogram traversing mode employed to obtain the particular velocity profile.
- o Identification of the total point histograms taken along each of the traverses. For example, H 128-134 indicates that 7 point histograms were obtained along the indicated traverse and are identified by the numbers H128 through H134. The actual locations of these stationary modes of LV operation are identified on the pertaining trace presented in Subsection 5.4. The mean and turbulent velocities associated with each of these histograms along with specific definition of its location are summarized also in the LV data tables of Subsection 5.4.

### 5.3 Laser Velocimeter Calibration Data

A set of axial and radial (E-W) LV traverse calibration plots are provided as follows:

- o Figure 5.6 - Axial traverse calibration (axial distance measured from a reference in feet versus potentiometer output in volts).
- o Figure 5.7 - East to West Radial traverse calibration (radial distance measured relative to a reference in inches versus potentiometer output in volts).

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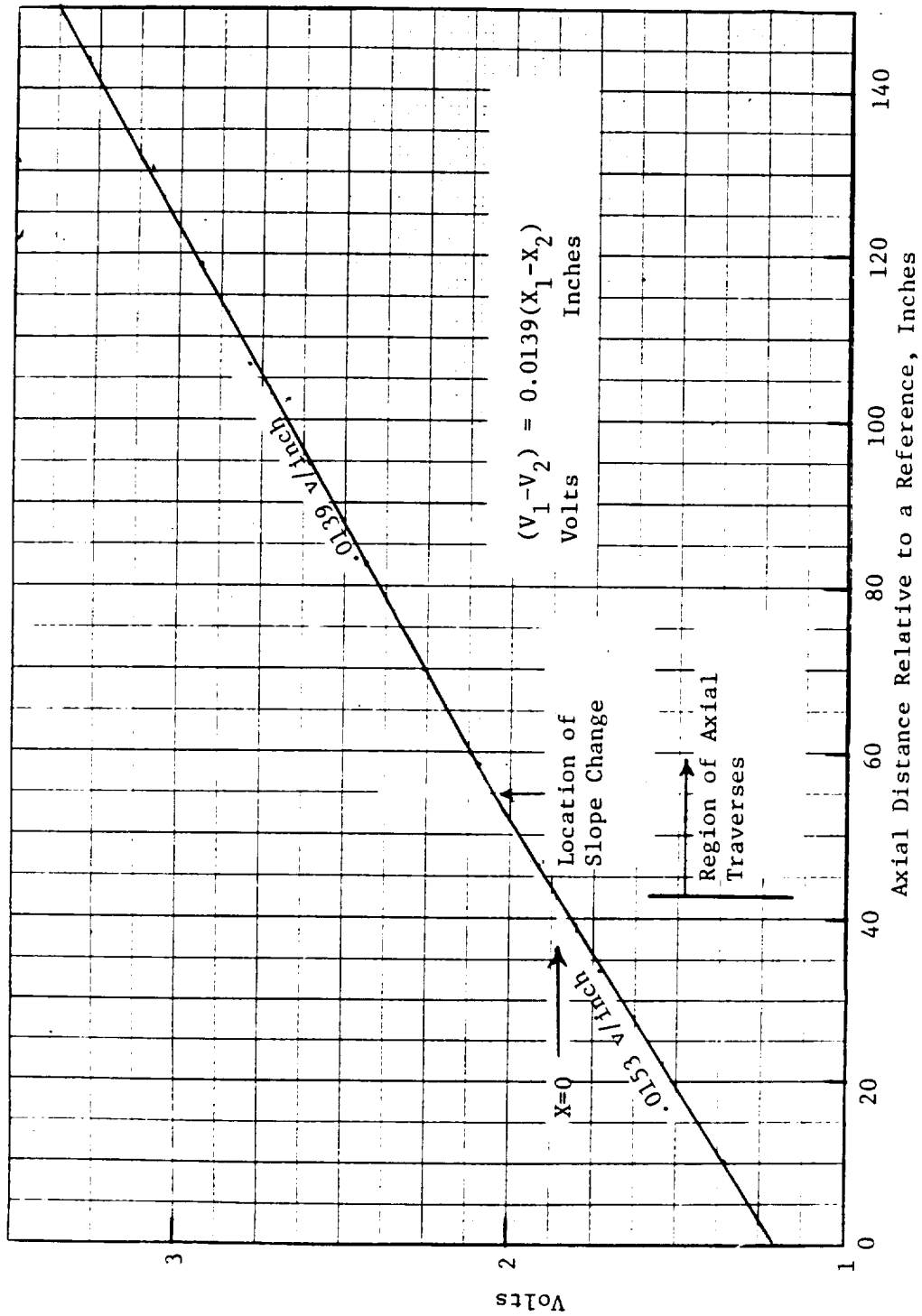


Figure 5.6. Axial LV Traverse Calibration.

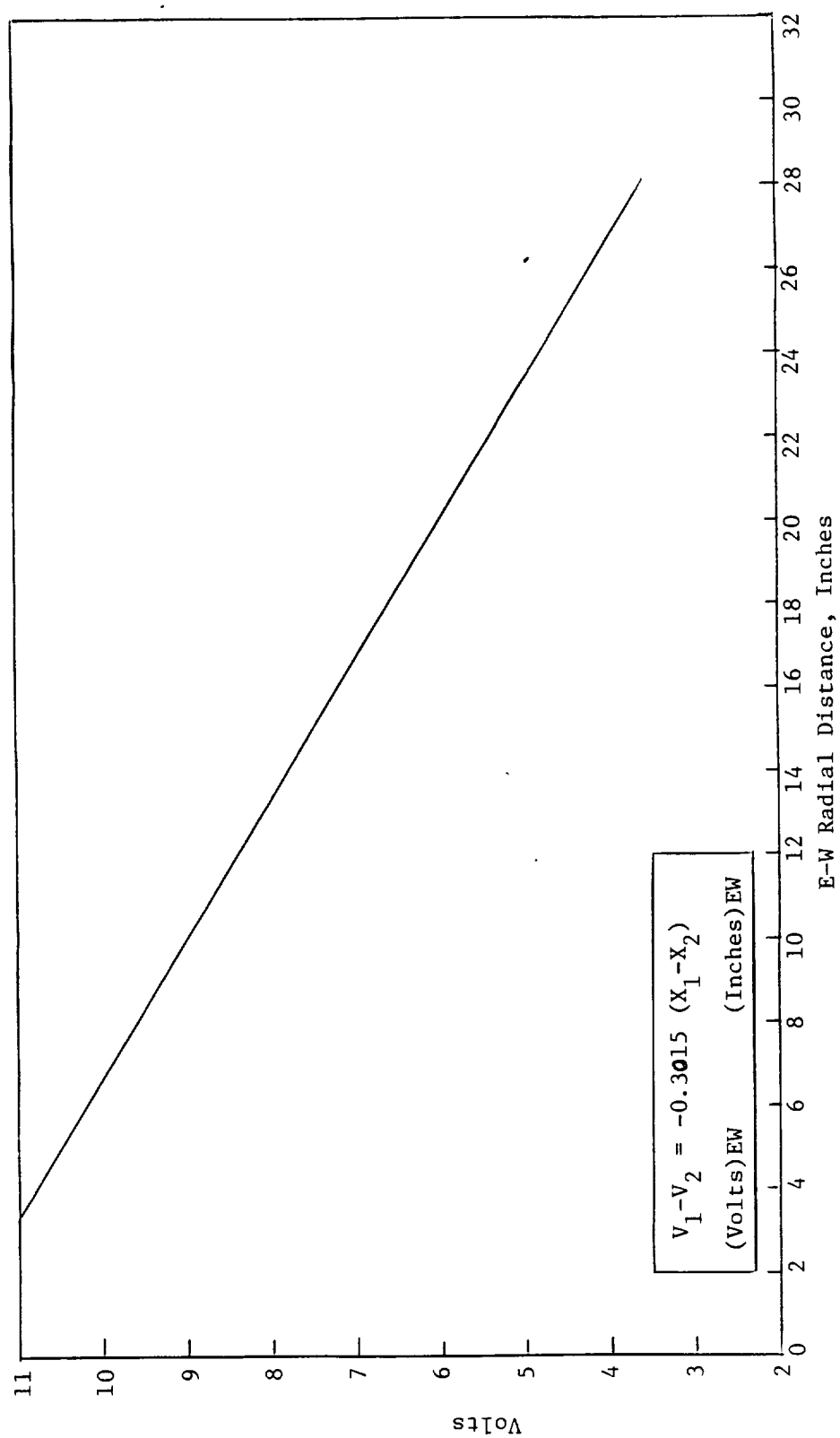


Figure 5.7 East to West Radial LV Traverse Calibration.

To facilitate the use of the traverse calibration data in the analyses of the LV results, linear regression of the measured voltages as a function of the traversed distances has been conducted. The resulting expressions pertaining to each of the calibration plots are provided in Figures 5.6 and 5.7.

The calibration needed for converting Y-axis of pen and minihistogram traces to velocity in feet per second is presented in Figure 5.8. The calibration yielded, on an average, a value of 390 fps per unit of pen movement on the Y-axis of the X-Y plots.

#### 5.4 Laser Velocimeter Test Data

The measured data for each of the LV Test Points 1 through 4 of Table 5-I are presented as follows:

1. Scope of traverses and histograms associated with each of the test points (repeat of Figures 5.2 through 5.5).
2. Tabulated data (Tables 5-II through 5-V) that identify the types and locations of traverses, the histogram numbers and their locations, the histogram measured mean and turbulent velocities, and the velocities normalized with respect to the mixed stream exit velocity ( $v_{mix}$ ). The format used to tabulate these parameters is illustrated in Figure 5.9.
3. Copies of the individual LV mean velocity traces obtained on the X-Y plotters. The type of traces provided with each of the test points is illustrated in a typical pen axial, and a minihistogram and pen radial traces provided in Figures 5.10 through 5.12, respectively.

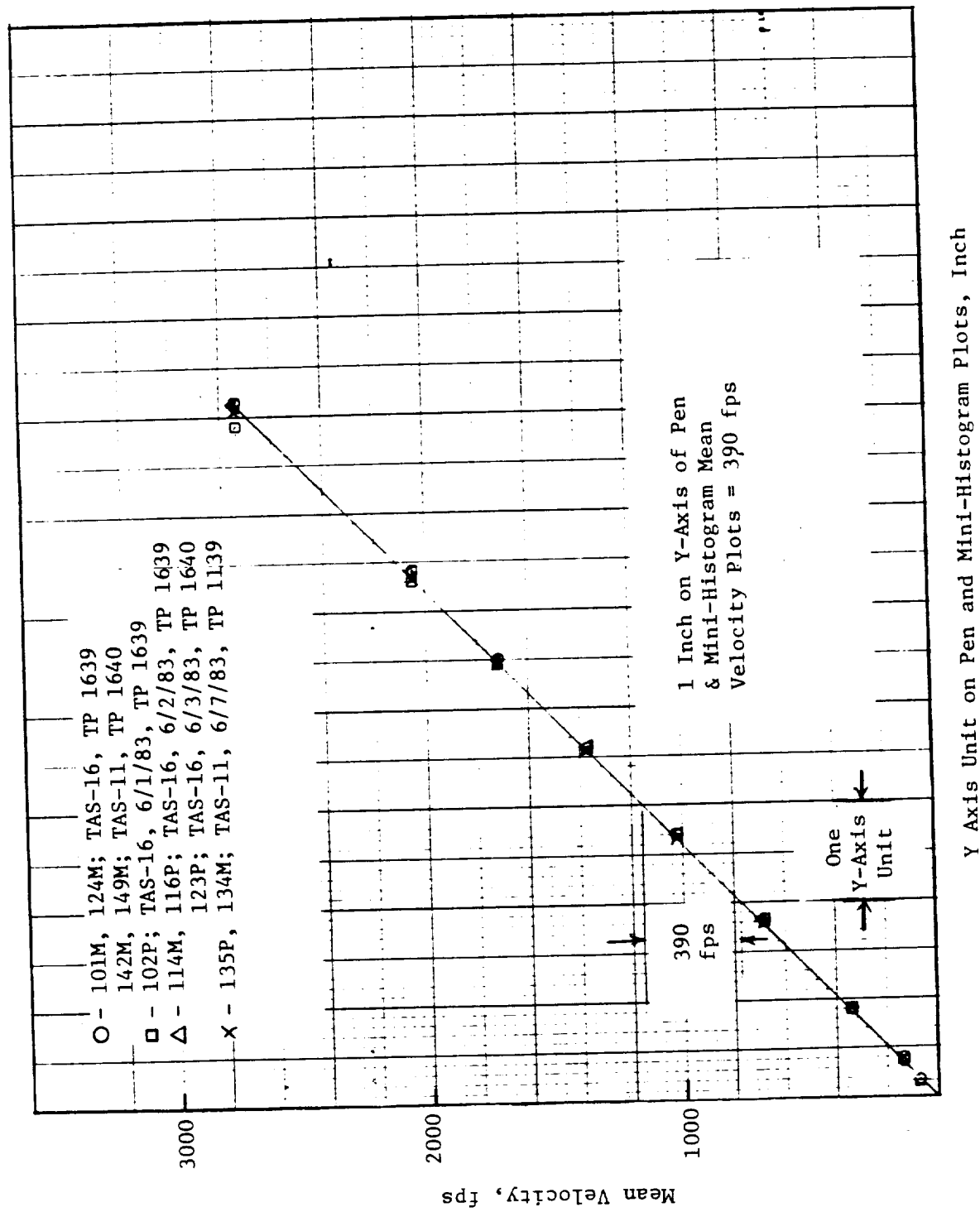


Figure 5.8. Mean Velocity Calibration for Pen and Mini-Histogram Y-Axis



Table

## Laser Velocimeter Measurement Data

Configuration: TAS-11

LV Test Point: \_\_\_\_\_

Matching

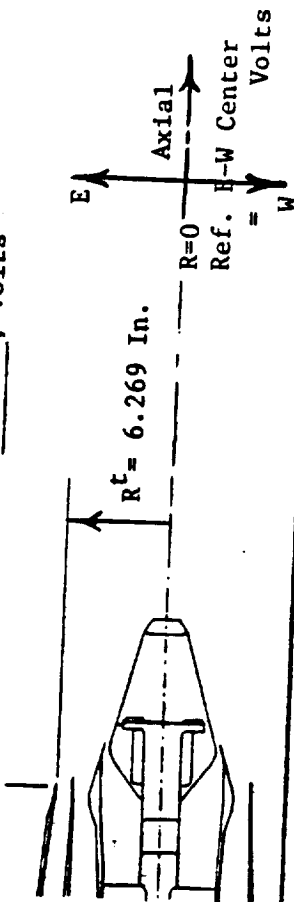
Acoustic

Test Point: \_\_\_\_\_

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit = \_\_\_\_\_, Volts



$V^{mix} =$  \_\_\_\_\_ fps

$V^0 =$  \_\_\_\_\_ fps

$V^1 =$  \_\_\_\_\_ fps

$V^8 =$  \_\_\_\_\_ fps

$V_{ac} =$  \_\_\_\_\_ fps

Pen Trace Identification Number (e.g. 243P)	Minihistogram Trace Identification Number (e.g. 244M)	Type of Traverse (Axial or E-W Radial)	Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
					Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	

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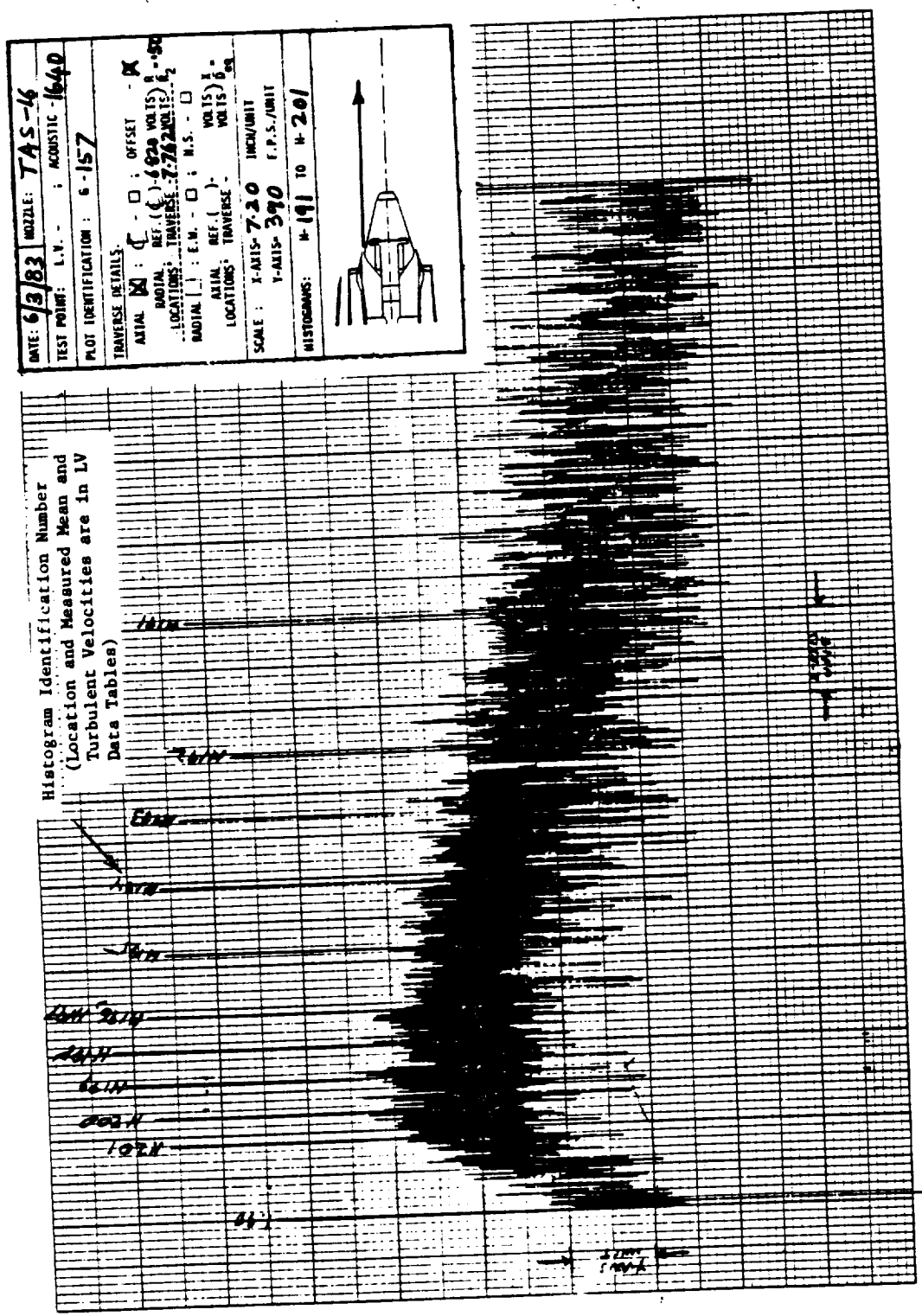


Figure 5-10. Illustration of Axial Mean Velocity Trace Obtained (Analog) with a Pen Traverse.

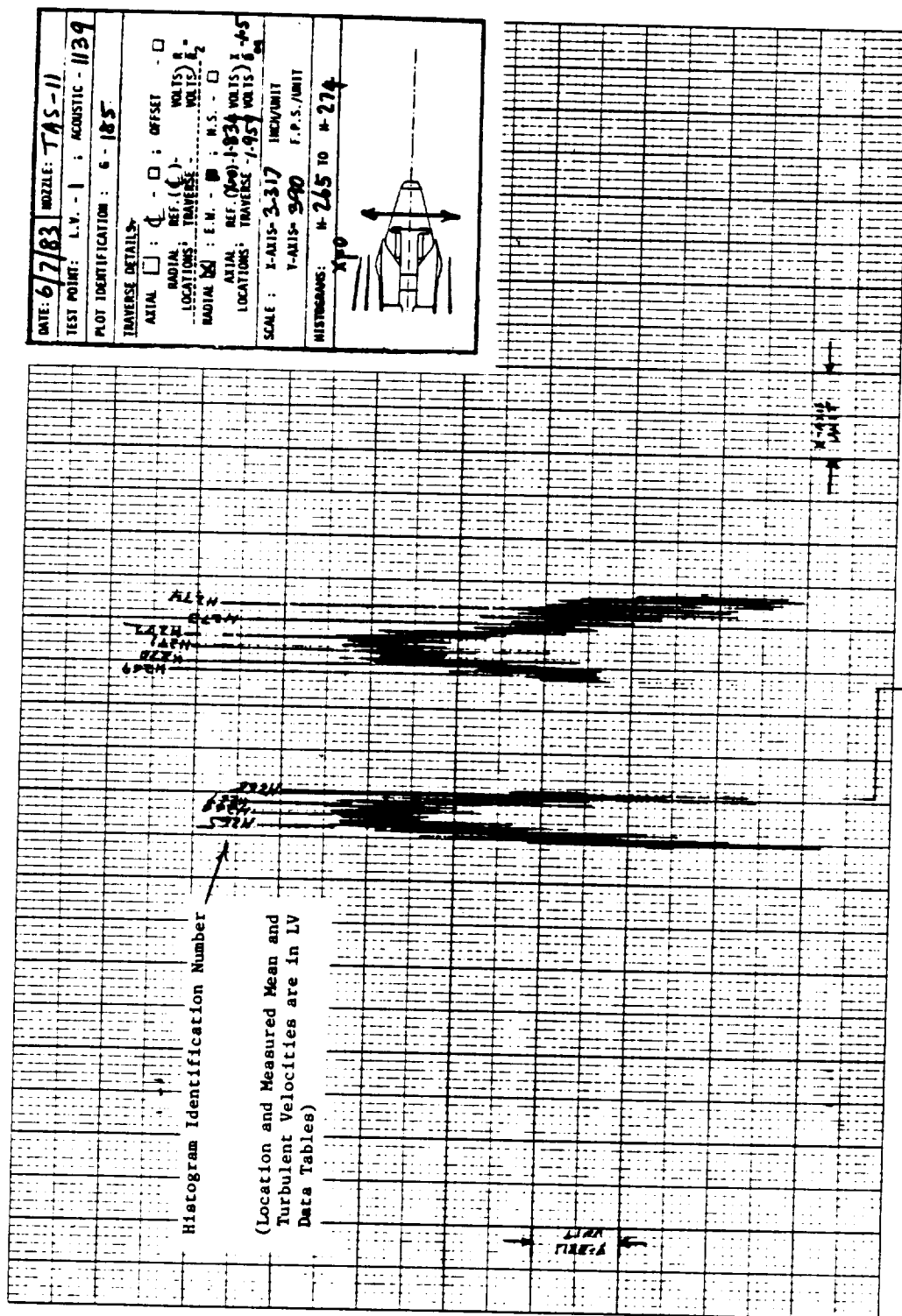


Figure 5-11. Illustration of Radial Mean Velocity Trace (Analog) Obtained with a Pen Traverse.

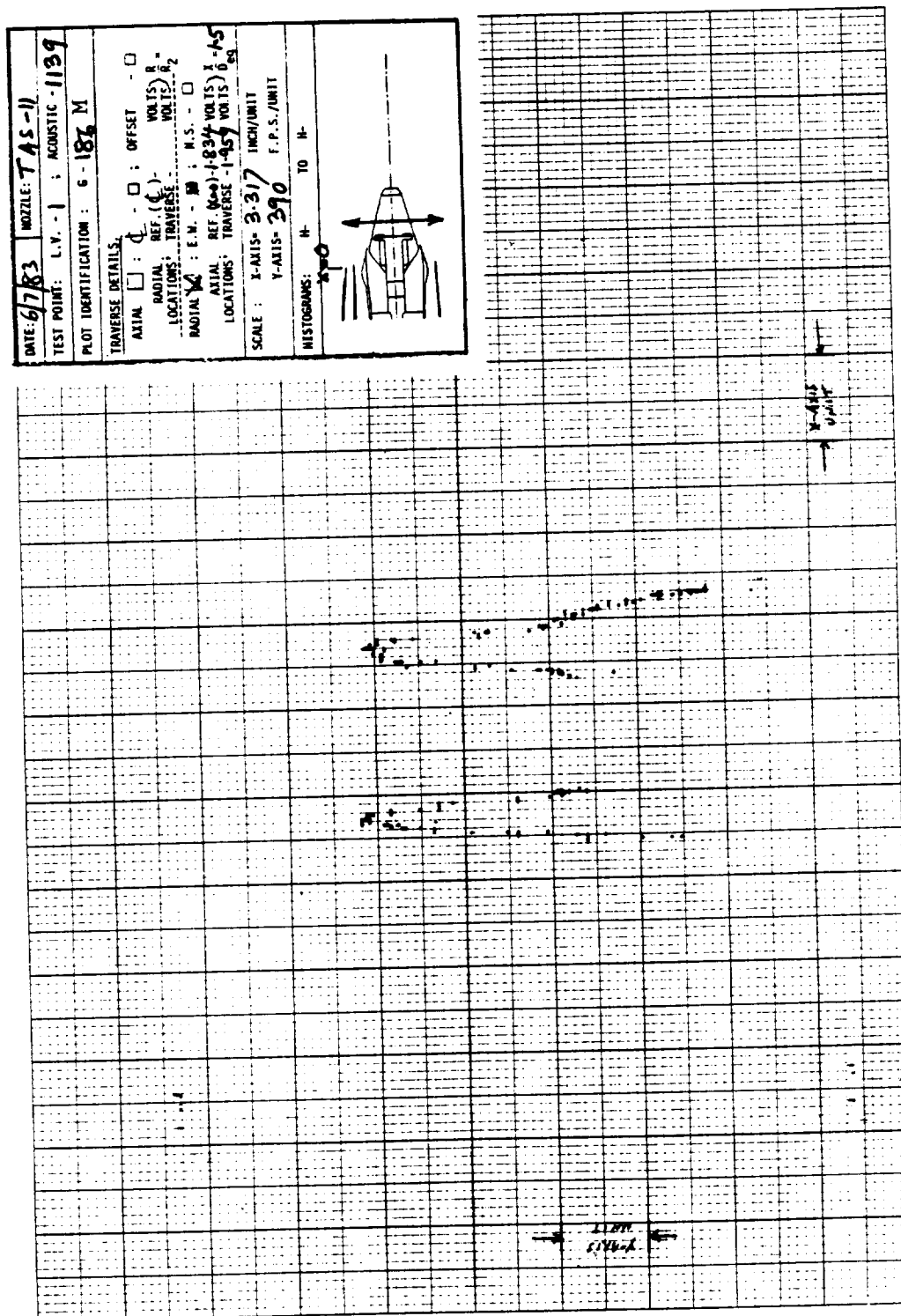
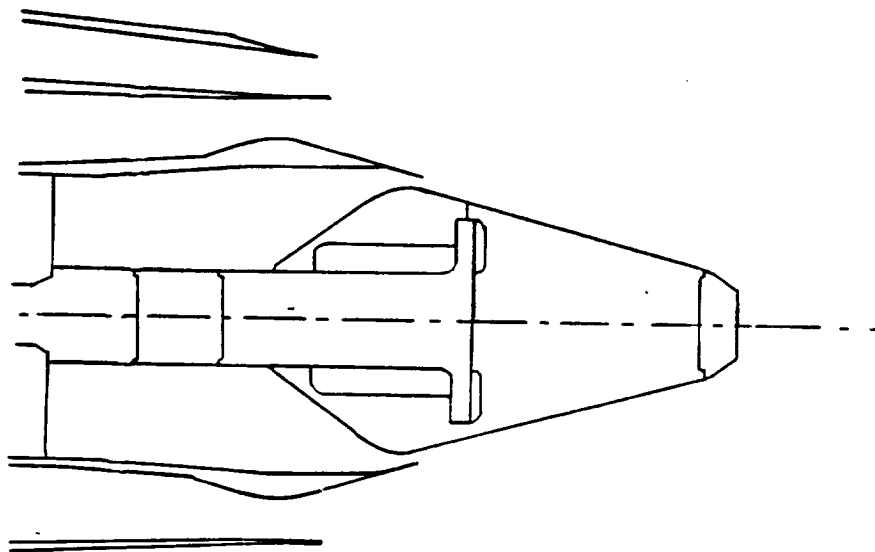


Figure 5-12. Illustration of Radial Mean Velocity Trace (Digital) Obtained with a Minihistogram.

5.4.1 LV Data of Unsuppressed Coannular Plug Nozzle with 180° Thermal Acoustic Shield (TAS-11).



The Test Points are Made up of One Static and One Simulated Flight Points (LV Test Points 1 and 2) at Typical Takeoff Condition (See Table 5-I for Aerodynamic Conditions).

LASER VELOCIMETER TEST POINT 1

Figure 5.2 Pictorial Representation of Scope of IV Measurements

517

Table 5-II. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.834, Volts

Configuration: TAS-11

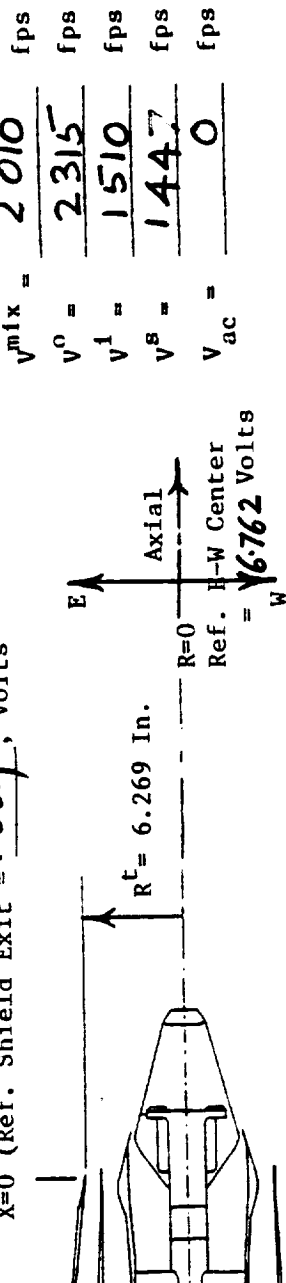
LV Test Point: 1

Matching

Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$



Graph Number			Type (A-E)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments	
Pen	Mini	Volts			Inches		Normalized		Feet/Sec.		Normalized			
		Axial			E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'	V̄/V <sup>mix</sup>		V'/V <sup>mix</sup>
167	166	AXIAL	-	6.762	-	0.0	-	0.0	-	-	-	-	NOZZLE AXIS	
169	170	AXIAL	-	5.292	-	4.876	-	0.77	-	-	-	-	WEST	
171	172	AXIAL	-	8.220	-	4.836	-	0.77	-	-	-	-	EAST	
173	174	AXIAL	-	8.509	-	5.794	-	0.924	-	-	-	-	EAST	
175	176	AXIAL	-	7.711	-	3.148	-	0.50	-	-	-	-	EAST	
			212	2.665		59.78		10.00		1344	306	0.669	0.152	
			213	2.499		47.84		8.00		1492	334	0.742	0.166	
			214	2.416		41.87		7.00		1580	334	0.786	0.166	
			215	2.250		29.93		5.00		1634	292	0.813	0.145	
			216	2.334		35.97		6.02		1636	335	0.814	0.167	Y



Table 5-II. Laser Velocimeter Measurement Data

Configuration: TAS-II

LV Test Point: 1

Matching

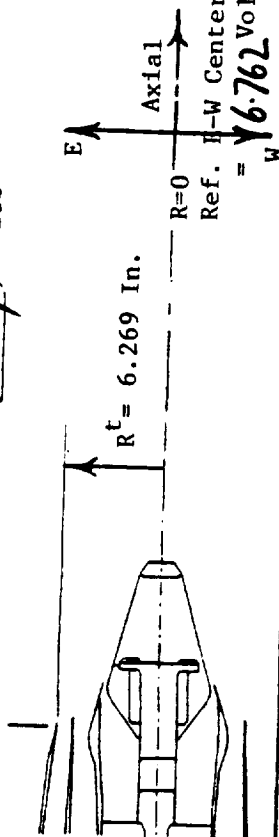
Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.98 In.

X=0 (Ref. Shield Exit = 1.834, Volts

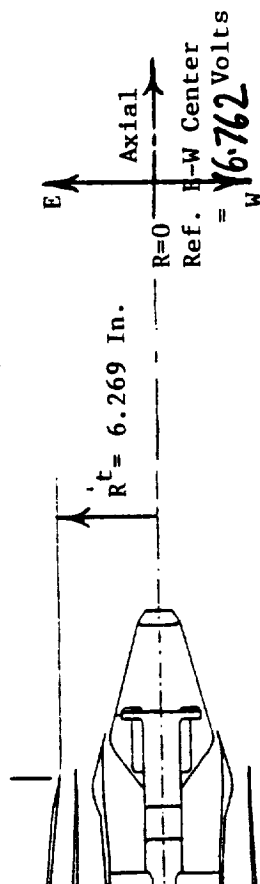


$V^{mix} = 2010$  fps  
 $V^0 = 2315$  fps  
 $V^1 = 1510$  fps  
 $V^s = 1447$  fps  
 $V_{ac} = 0$  fps

W 10/10Z

Graph Number		Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
175			217	2.167	7.711	23.96	3.148	4.01	0.50	1641	234	0.816	0.116	EAST
			218	2.126		21.01		3.51		1628	197	0.810	0.098	
			219	2.084		17.99		3.00		1613	167	0.802	0.083	
			220	2.042		14.96		2.50		1666	160	0.829	0.080	
			221	2.017		13.17		2.20		1865	178	0.928	0.089	
			222	1.959		8.99		1.50		2302	68	1.145	0.034	
			223	-	✓	-	✓	-	✓	1700	NO DATA			✓
177	178	AXIAL	-	-	5.813	-	3.148	-	0.50	-	-	-	-	WEST
			224	2.665		59.78		10.00		1449	230	1.7		
			225	2.499	✓	47.84	✓	8.00	✓	1553	270	0.773	0.134	✓

X=0 (Ref. Shield Exit) = 1.834, Volts



$$\begin{aligned}
 v^{int} &= \frac{2010}{\text{fps}} \\
 v^0 &= \frac{2315}{\text{fps}} \\
 v^1 &= \frac{1510}{\text{fps}} \\
 v^s &= \frac{1447}{\text{fps}} \\
 v_{ac} &= \frac{0}{\text{fps}}
 \end{aligned}$$

**Configuration: TAS-11**

**LV Test Point: 1**

### Matching

Matching  
Acoustic  
Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

[illegible]



Table 5-II. Laser Velocimeter Measurement Data

Configuration: TAS-11

LV Test Point: 1

Matching

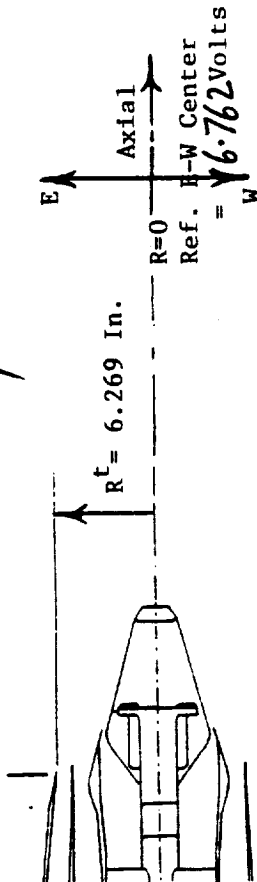
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit = 1.834, Volts



$$v_{mix} = 2010 \text{ fps}$$

$$v^0 = 2315 \text{ fps}$$

$$v^1 = 1510 \text{ fps}$$

$$v^s = 1447 \text{ fps}$$

$$v_{ac} = 0 \text{ fps}$$

Graph Number		Type (Ax. - H-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
								Axial	E-W	Axial	E-W		X/D <sub>eq</sub>	R/R <sup>t</sup>
183	184	E-W	-	1.917	-	5.971	-	1.00	-	-	-	-	-	-
			248		5.771		3.287		0.524	1388	119	0.691	0.059	EAST
			249		5.633		3.745		0.597	2258	94	1.123	0.047	
			250		5.573		3.944		0.629	2171	367	1.080	0.183	
			251		5.578		3.927		0.626	Insufficient Samples				
			252		5.505		4.169		0.665	2244	121	1.116	0.060	
			253		5.505		4.169		0.665	2249	74	1.119	0.037	
			254		5.443		4.375		0.698	2070	228	1.03	0.113	
			255		5.337		4.726		0.754	1237	291	0.615	0.145	WEST
			256		8.340		5.234		0.835	1163	206	0.579	0.103	WEST

Table 5-II. Laser Velocimeter Measurement Data

Configuration: TAS-11

LV Test Point: 1

Matching

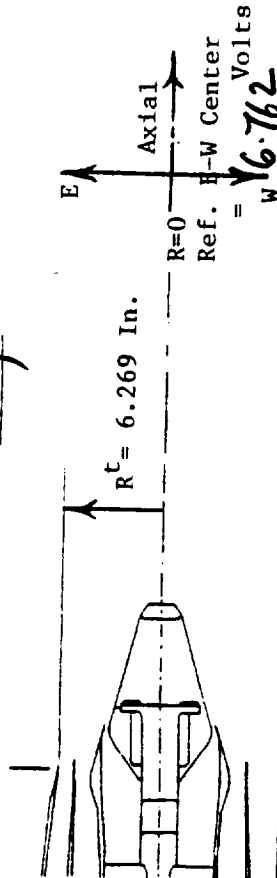
Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit = 1.834, Volts



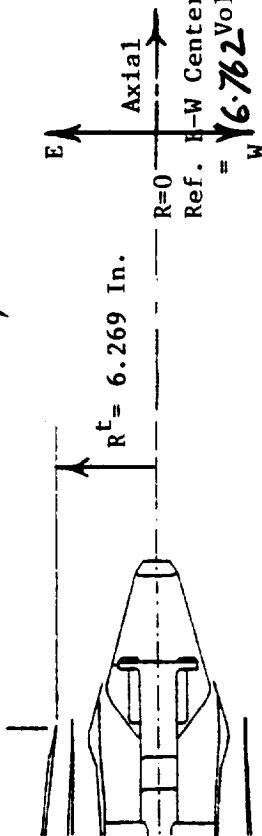
$V^{mix} =$  2010 fps  
 $V^0 =$  2315 fps  
 $V^1 =$  1510 fps  
 $V^S =$  1447 fps  
 $V_{ac} =$  0 fps

W 0.16 Z

Graph Number		Pen	Mini	Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
						Volts		Inches		Normalized		Feet/Sec.				
						Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	$V'/V^{mix}$
183					257	1917	8.234	5.971	4.882	1.00	0.780	1371	134	0.682	0.067	WEST
					258		8.120		4.504		0.718	1423	124	0.708	0.062	
					259		7.978		4.033		0.643	1986	182	0.988	0.091	
					260		8.054		4.285		0.684	1492	200	0.742	0.100	
					261		7.898		3.768		0.601	2187	78	1.088	0.039	
					262		7.794		3.423		0.546	2102	72	1.046	0.036	
					263		7.738		3.237		0.516	1988	114	0.989	0.057	
					264		7.606		2.799		0.447	1274	66	0.634	0.033	✓
185		186	E-W			1.959	-	8.993	-	1.50	-	-	-	-	-	-
					265		5.608		3.828		0.611	2063	217	1.026	0.108	WEST

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ in.}$$

X=0 (Ref. Shield Exit) = 1.834; Volts



$v_{max} =$	<u>2010</u>	fps
$v^0 =$	<u>2315</u>	fps
$v^1 =$	<u>1510</u>	fps
$v^S =$	<u>1447</u>	fps
$v_{ac} =$	<u>0</u>	fps

[illegible]

Table 5-II. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.834, Volts

Configuration: TAS-11

LV Test Point: 1

Matching

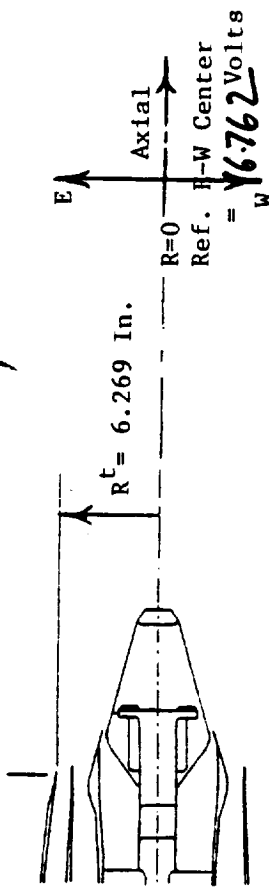
Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.98 In.

$v^{mix} =$  2610 fps  
 $v^0 =$  2315 fps  
 $v^1 =$  1510 fps  
 $v^s =$  1447 fps  
 $v_{ac} =$  6 fps



Graph Number		Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.				
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
187	188	E-W	-	2.017	-	13.17	-	2.20	-	-	-	-	-	-
			275		5.574		3.940		0.629	1003	228	0.50	0.113	WEST
			276		5.722		3.449		0.550	1637	298	0.814	0.148	
			277		5.879		2.929		0.467	2247	139	1.118	0.069	
			278		6.039		2.398		0.383	2167	133	1.078	0.066	
			279		6.176		1.944		0.310	1704	167	0.848	0.083	
			280		6.321		1.463		0.233	1383	48	0.688	0.024	Y
			281		7.059		0.985		0.157	1435	85	0.714	0.042	EAST
			282		7.252		1.625		0.259	1915	197	0.953	0.098	
			283		7.468		2.342	Y	0.374	2302	104	1.145	0.052	Y

Table 5-II. Laser Velocimeter Measurement Data

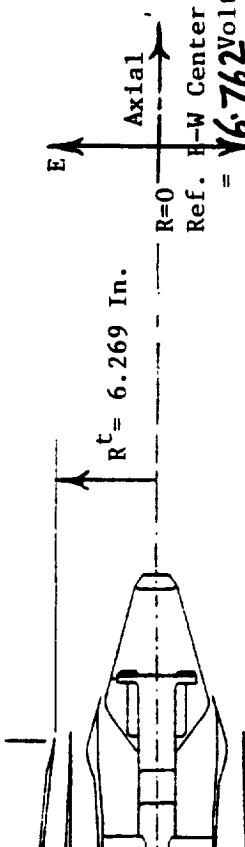
Configuration: TAS-II

I/V Test Point: 1

Matching Acoustic Test Point: 1139

$D_{eq} = \sqrt{4(A^0 + A^1)}/\pi$   
= 5.98 In.

X=0 (Ref. Shield Exit = 1.834, Volts



$R^t = 6.269$  In.  
Ref. H-W Center  
= 16.762 Volts

$v^{mix} = 2010$  fps  
 $v^0 = 2315$  fps  
 $v^1 = 1510$  fps  
 $v^s = 1447$  fps  
 $v_{ac} = 0$  fps

Graph Number		Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.				
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'		V̄/V <sup>mix</sup>	V'/V <sup>mix</sup>
187			284	2.017	7.598	13.17	2.773	2.20	0.442	2342	76	1.165	0.038	EAST
			285		7.730		3.211		0.512	1964	180	0.977	0.09	
			286		7.730		3.211		0.512	1961	183	0.976	0.091	
			287		7.874		3.688		0.588	1476	115	0.734	0.057	
			288		8.042		4.245		0.677	1284	179	0.639	0.089	
✓			289	✓	8.147	✓	4.594	✓	0.733	1094	211	0.544	0.105	✓
189	190	E-W	-	2.084	-	17.99	-	3.01	-	-	-	-	-	-
			290		5.773		3.280		0.523	1580	275	0.786	0.137	WEST
			291		6.022		2.454		0.392	2265	114	1.127	0.057	
✓			292	✓	6.312		1.493	✓	0.238	1724	136	0.858	0.068	✓



Table 5-II. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit) = 1.834, Volts

Configuration: TAS-11

LV Test Point: 1

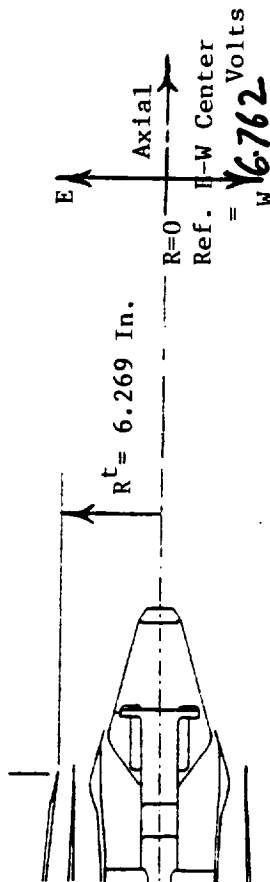
Matching

Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

$V^{mix} = 2010$  fps  
 $V^0 = 2315$  fps  
 $V^1 = 1510$  fps  
 $V^S = 1447$  fps  
 $V_{ac} = 0$  fps



Graph Number		Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.				
Pen	Min1			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
189			293	2.084	6.650	17.99	0.371	3.01	0.060	1310	116	0.652	0.058	WEST
			294		6.988		0.750		0.120	1671	171	0.831	0.085	EAST
			295		7.245		1.602		0.256	2106	171	1.048	0.085	
			296		7.473		2.358		0.376	2334	186	1.161	0.053	
			297		7.650		2.945		0.470	2056	199	1.023	0.100	
			298		7.848		3.602		0.575	1455	155	0.724	0.077	
			299		8.224		4.849		0.774	906	183	0.451	0.091	
191	192	E-W	-	1.851	-	1.223	-	0.21	-	-	-	-	-	-
			300		8.258		4.962		0.791	2098	207	1.044	0.103	EAST
			301		8.163		4.647		0.741	1924	309	0.957	0.154	

$$D_{eq} = \sqrt{4(A^o + A^1)/\pi} = 5.98 \text{ in.}$$

Diagram illustrating the electric field distribution along the axial direction of a rocket engine nozzle. The diagram shows a cross-section of the nozzle on the left, with a vertical dashed line representing the axis. The electric field  $E$  is indicated by a horizontal arrow pointing to the right. The field is zero at the reference point ( $R=0$ ) and increases linearly to  $16.762$  Volts at the tip ( $R^t = 6.269$  In.).

$v_{mix}^{mix} = 2010$  fps  
 $v_0^0 = 2315$  fps  
 $v_1^1 = 1510$  fps  
 $v_8^8 = 1447$  fps  
 $v_{ac} = 0$  fps

Graph Number		Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mlx}$	$V'/V^{mlx}$
191			302	1.851	5.527	1.223	4.096	0.21	0.653	2132	238	1.061	0.118	WEST
↓			303	↓	5.527	↓	4.096	↓	0.653	2054	251	1.022	0.125	↓
195	196	E-W	—	2.167	—	23.96	—	4.00	—	—	—	—	—	—
↓			305	↓	5.999	↓	2.531	↓	0.404	2164	188	1.077	0.094	WEST
↓			306	↓	6.607	↓	0.514	↓	0.080	1425	105	0.709	0.052	↓
↓			307	↓	7.418	↓	2.176	↓	0.347	2288	140	1.138	0.07	EAST
↓			308	↓	7.953	↓	3.950	↓	0.630	1270	211	0.632	0.105	
197	198	E-W	—	2.167	—	—	—	—	—	—	—	—	—	—
↓			309	↓	5.985	↓	2.577	↓	0.411	2157	183	1.073	0.091	WEST
↓			310	↓	6.259	↓	1.668	↓	0.266	1877	164	0.934	0.082	↓



$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ in.}$$

$V_{m'x} = 2010$  fps  
 $V_o = 2315$  fps  
 $V_i = 1510$  fps  
 $V_s = 1447$  fps  
 $V_{ac} = 0$  fps

[illegible]

Table 5-II. Laser Velocimeter Measurement Data

Configuration: TAS-11

IV Test Point: 1

Matching

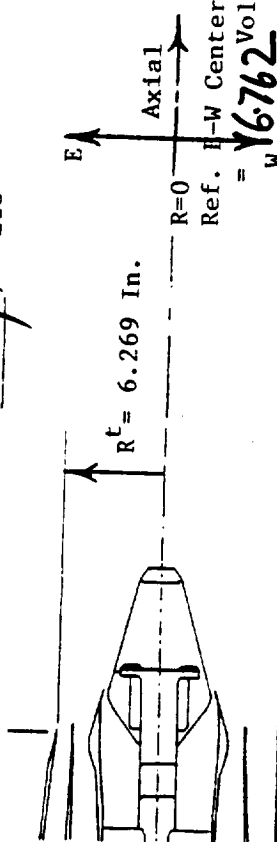
Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit) = 1.834, Volts



W 16/6Z

Graph Number		Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')					Comments
				Volts		Inches		Normalized		Feet/Sec.			
Pen	Min1			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$
202	203	E-W	-	2.665	-	59.78	-	10.00	-	-	-	-	-
			329	7.506			2.468		0.394	1559	291	0.776	0.145
			330	7.506			2.468		0.394	1557	293	0.776	0.145
			331	7.037			0.912		0.145	1777	210	0.884	0.105
			332	6.565			0.653		0.104	1716	160	0.854	0.080
			333	6.084			2.249		0.359	1612	219	0.802	0.109
			334	5.623			3.778		0.603	1295	271	0.644	0.135
204	205	E-W	-	2.831	-	71.73	-	12.00	-	-	-	-	-
			335	7.972			4.013		0.640	1131	271	0.563	0.135
			336	7.315			1.834		0.293	1472	286	0.732	0.142

Table 5-II. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit) = 1.834, Volts

Configuration: TAS-11

LV Test Point: 1

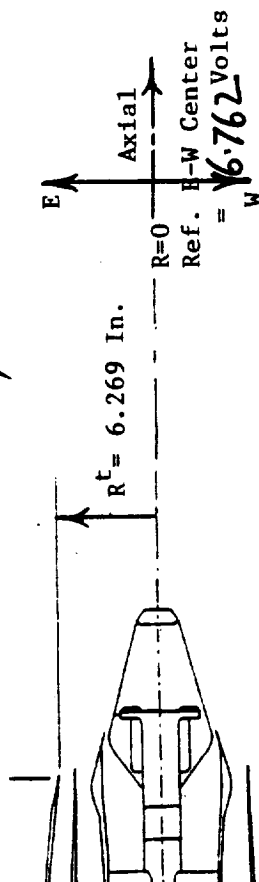
Matching

Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

$v^{mix} =$  2010 fps  
 $v^0 =$  2315 fps  
 $v^1 =$  1510 fps  
 $v^s =$  1447 fps  
 $v_{ac} =$  0 fps



Graph Number	Pen	Mini	Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments
					Volts	Inches	Normalized	Feet/Sec.	Normalized	Feet/Sec.	Normalized	Comments	
					Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}/V^{mix}$	V'	$V'/V^{mix}$		
204				337	2.831	6.646	12.00	0.061	1610	219	0.800	0.109	WEST
				338		6.100		0.350	1528	227	0.760	0.113	
				339		5.507		0.664	1241	254	0.617	0.126	
206		207	E-W	-	2.334	-	6.02	-	-	-	-	-	-
				340		7.814		0.557	1561	335	0.777	0.166	EAST
				341		7.434		0.356	2019	91	1.00	0.045	
				342		7.075		0.166	1880	176	0.935	0.088	
				343		6.751		0.006	1594	151	0.793	0.075	WEST
				344		6.448		0.166	1709	171	0.850	0.085	
				345		6.174		0.311	1934	134	0.962	0.067	

Table 5-II. Laser Velocimeter Measurement Data

Configuration: TAS-11

LV Test Point: 1

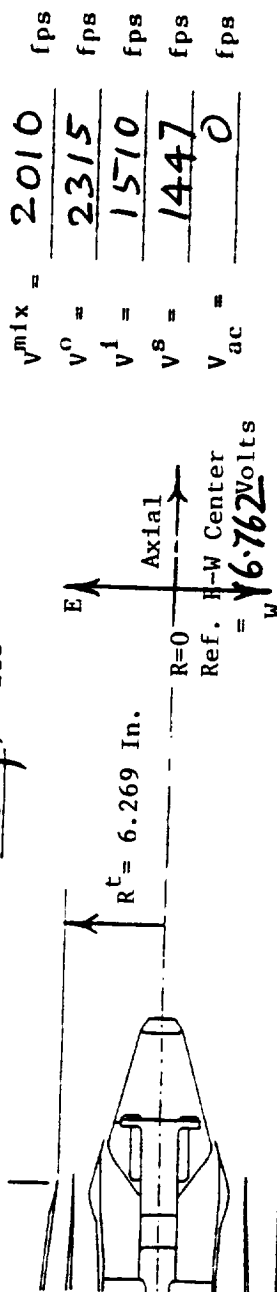
Matching

Acoustic

Test Point: 1139

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

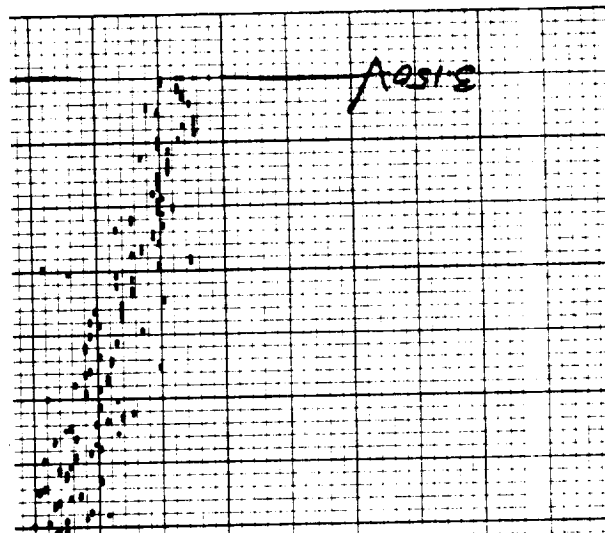
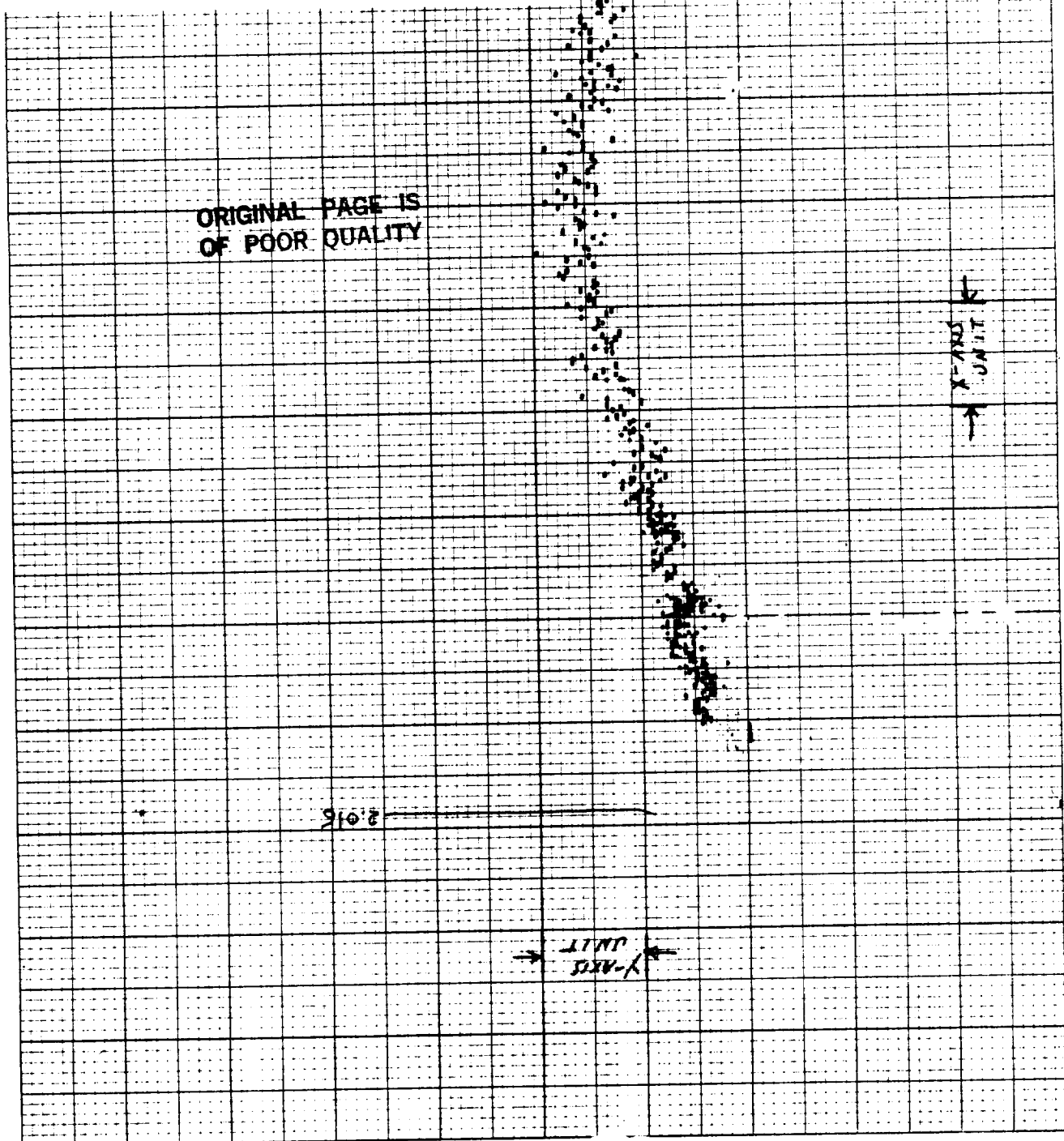
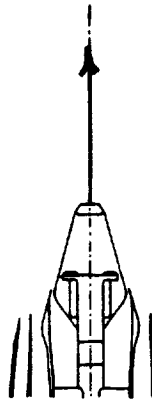
X=0 (Ref. Shield Exit = 1.834, Volts



W 10102

Graph Number		Type	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	MinI	(Ax.-E-W)		Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
206			346	2.334	5.799	35.97	3.194	6.02	0.509	1464	308	0.728	0.153	WEST
208	209	E-W	-	2.416	-	41.87	-	7.00	-	-	-	-	-	-
			347		7.304		1.798		0.287	1969	137	0.980	0.068	EAST
			348		6.218		1.804		0.288	1838	168	0.914	0.084	WEST
			349		6.114		2.149		0.343	1843	182	0.917	0.091	↓
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

DATE: 6/7/83	NOZZLE: TAS-11
TEST POINT: L.V. - 1 ; ACOUSTIC - 1139	
PLOT IDENTIFICATION: G-166	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : <input checked="" type="checkbox"/> ; OFFSET - <input type="checkbox"/>	
RADIAL REF. ( ) - 6762 VOLTS $R_2$ = 00	
LOCATIONS: TRAVERSE - 6762 VOLTS $R_2$	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS $X$	
LOCATIONS: TRAVERSE - VOLTS $Y$	
SCALE : X-AXIS= 320 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	





DATE: 6/7/83 NOZZLE: THS-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: 6-167

TRAVERSE DETAILS:

AXIAL ☒ :  $\downarrow$  -  $\uparrow$  ; OFFSET - ☐

RADIAL REF. (  $\downarrow$  ) - 6762 VOLTS  $R_2$  = 0.0

LOCATIONS: TRAVERSE - 6762 VOLTS  $R_2$

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

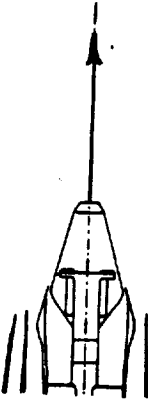
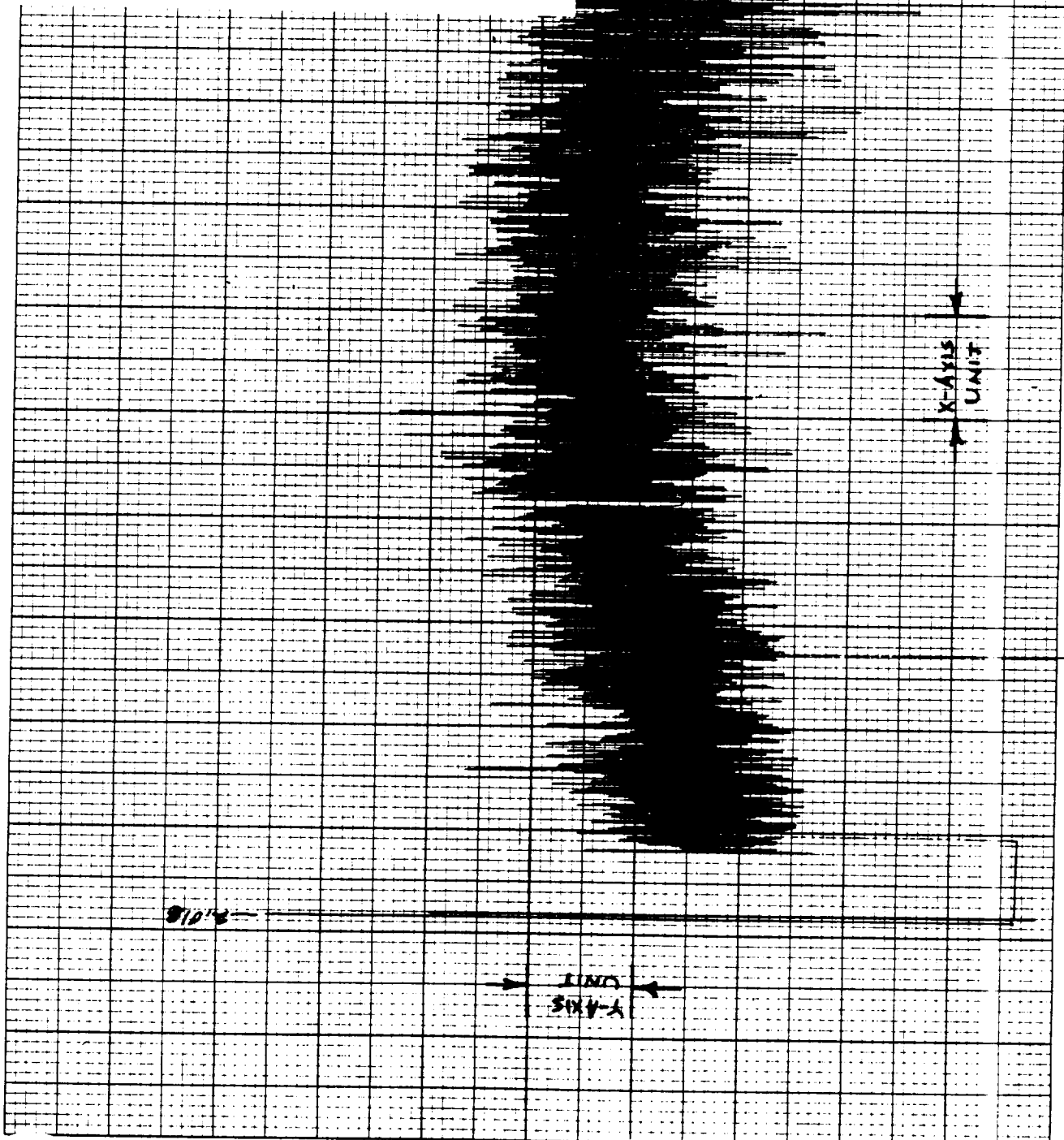
AXIAL REF. ( ) - VOLTS  $X_{eq}$

LOCATIONS: TRAVERSE - VOLTS

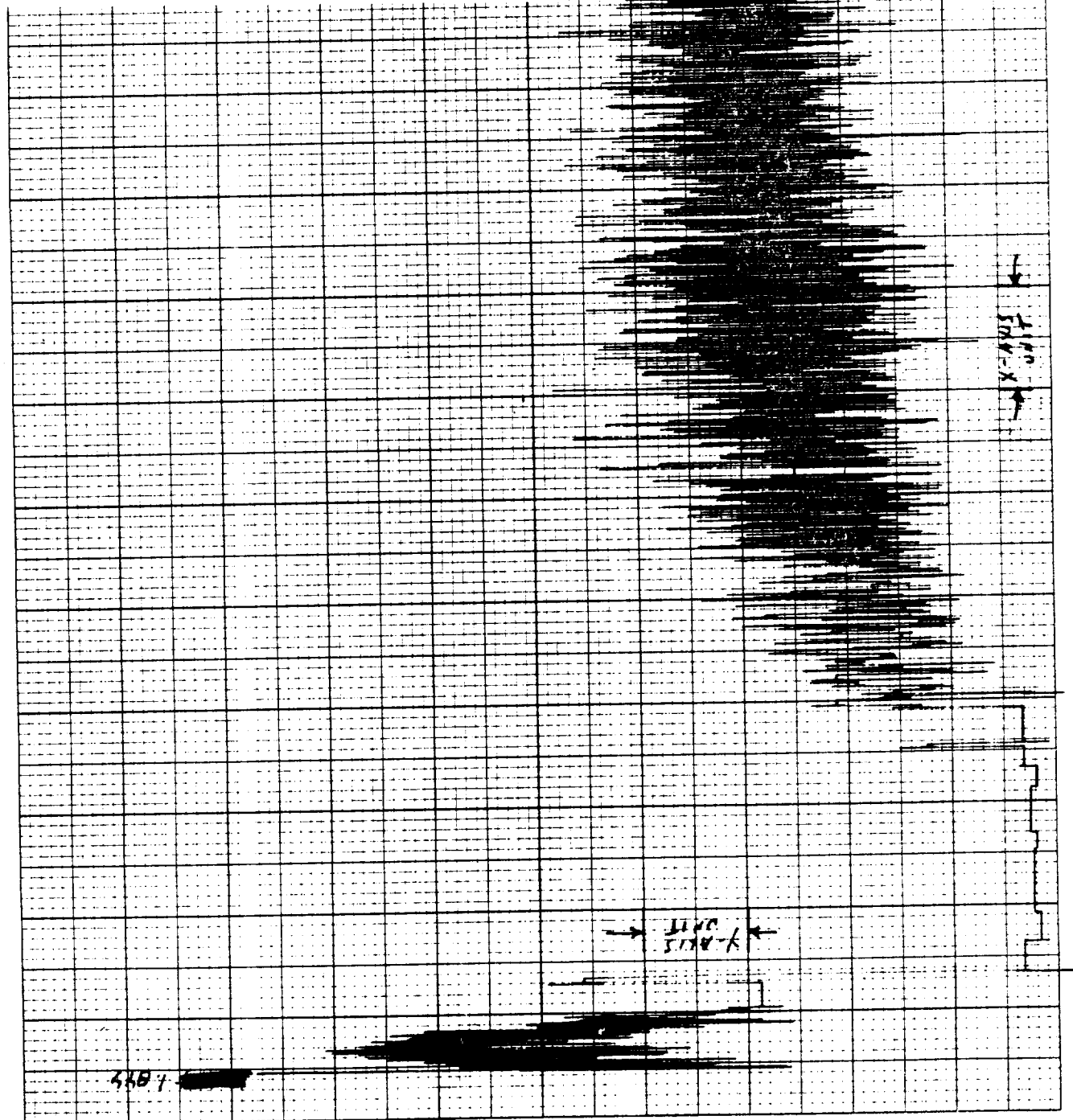
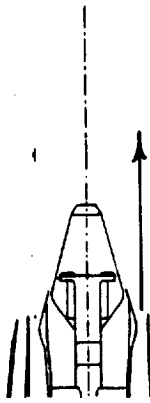
SCALE : X-AXIS = 7.20 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

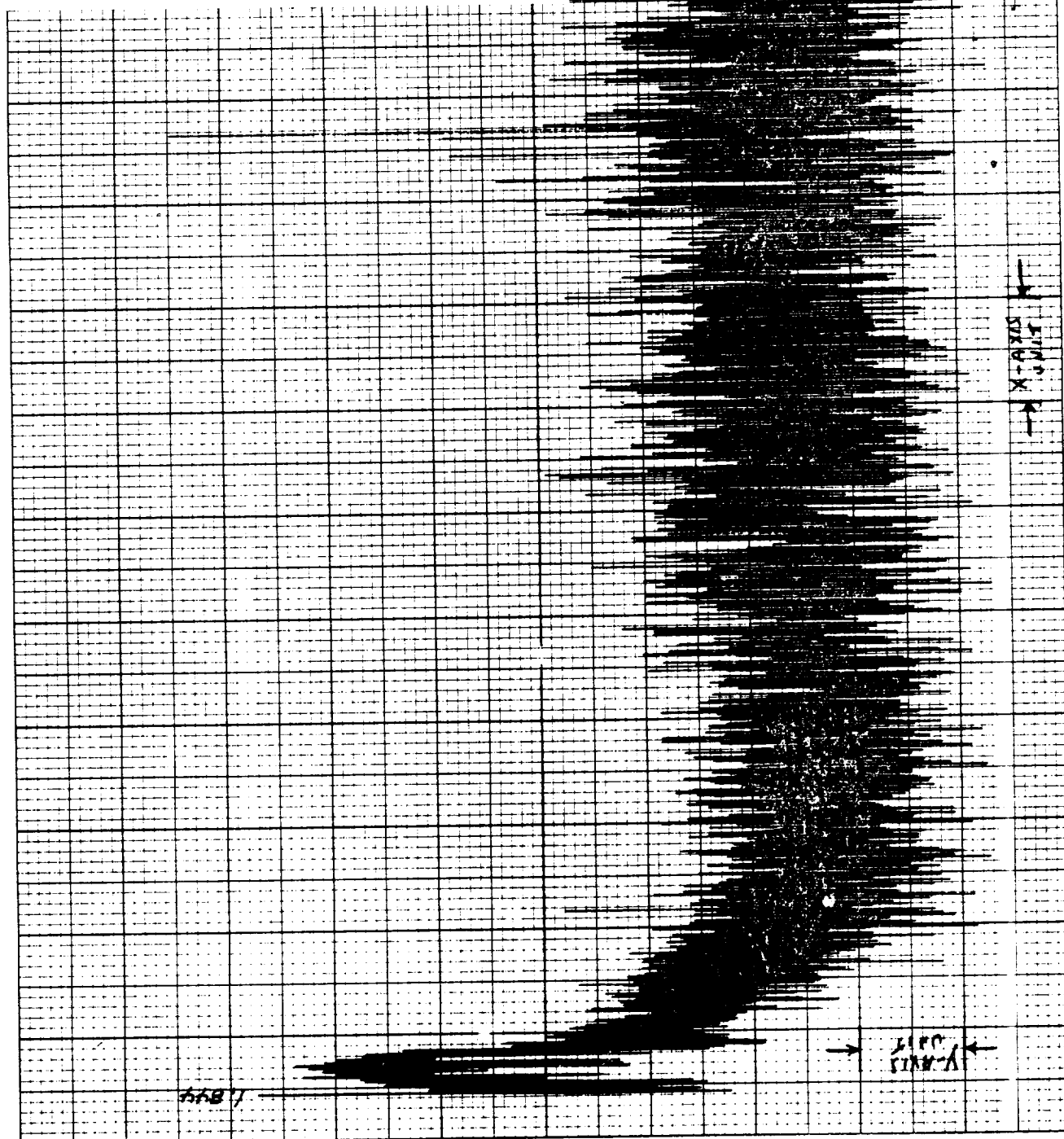
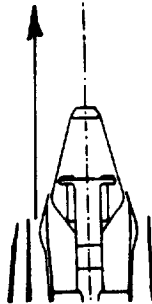



DATE: 6/7/83	NOZZLE: TAs-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-169	
TRAVERSE DETAILS.	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. ( ) - 6762 VOLTS	R = 27
LOCATIONS: TRAVERSE - 5.292 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) -	VOLTS X =
LOCATIONS: TRAVERSE -	VOLTS D =
SCALE : X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	

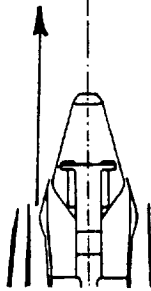




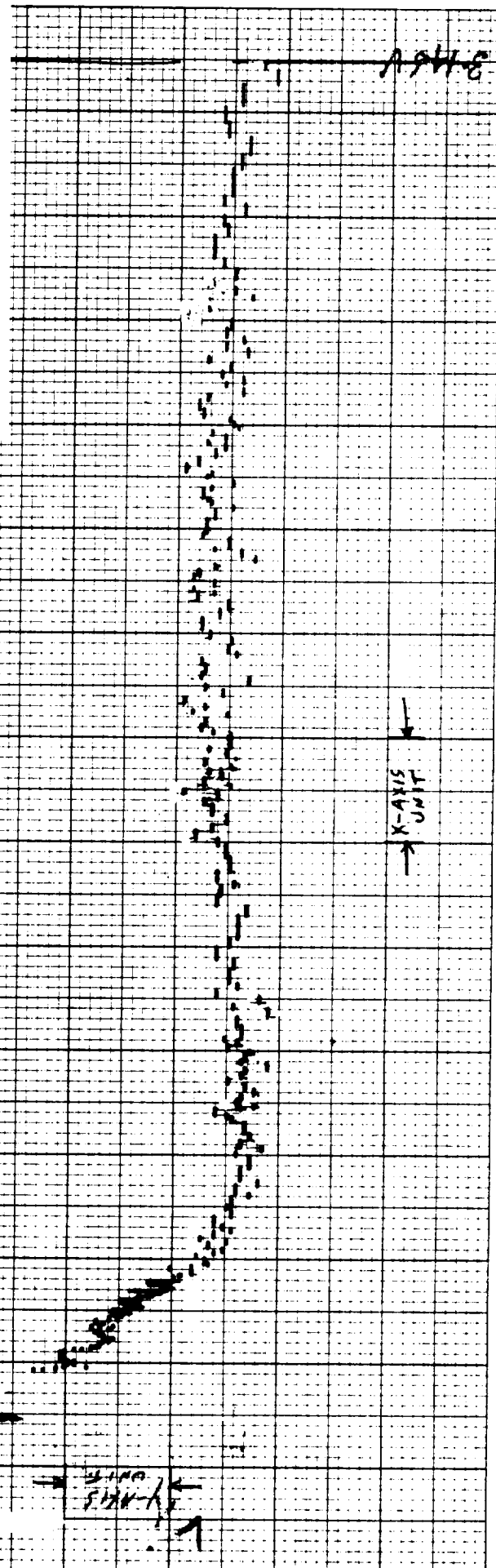
DATE: 6/7/83	NOZZLE: TMS-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-171	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> : OFFSET - 74	
RADIAL REF (C) - 6762 VOLTS R - 77	
LOCATIONS: TRAVERSE 8-220 VOLTS R - 2	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF ( ) - VOLTS $\frac{x}{d_{eq}}$	
LOCATIONS: TRAVERSE - VOLTS $\frac{x}{d_{eq}}$	
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



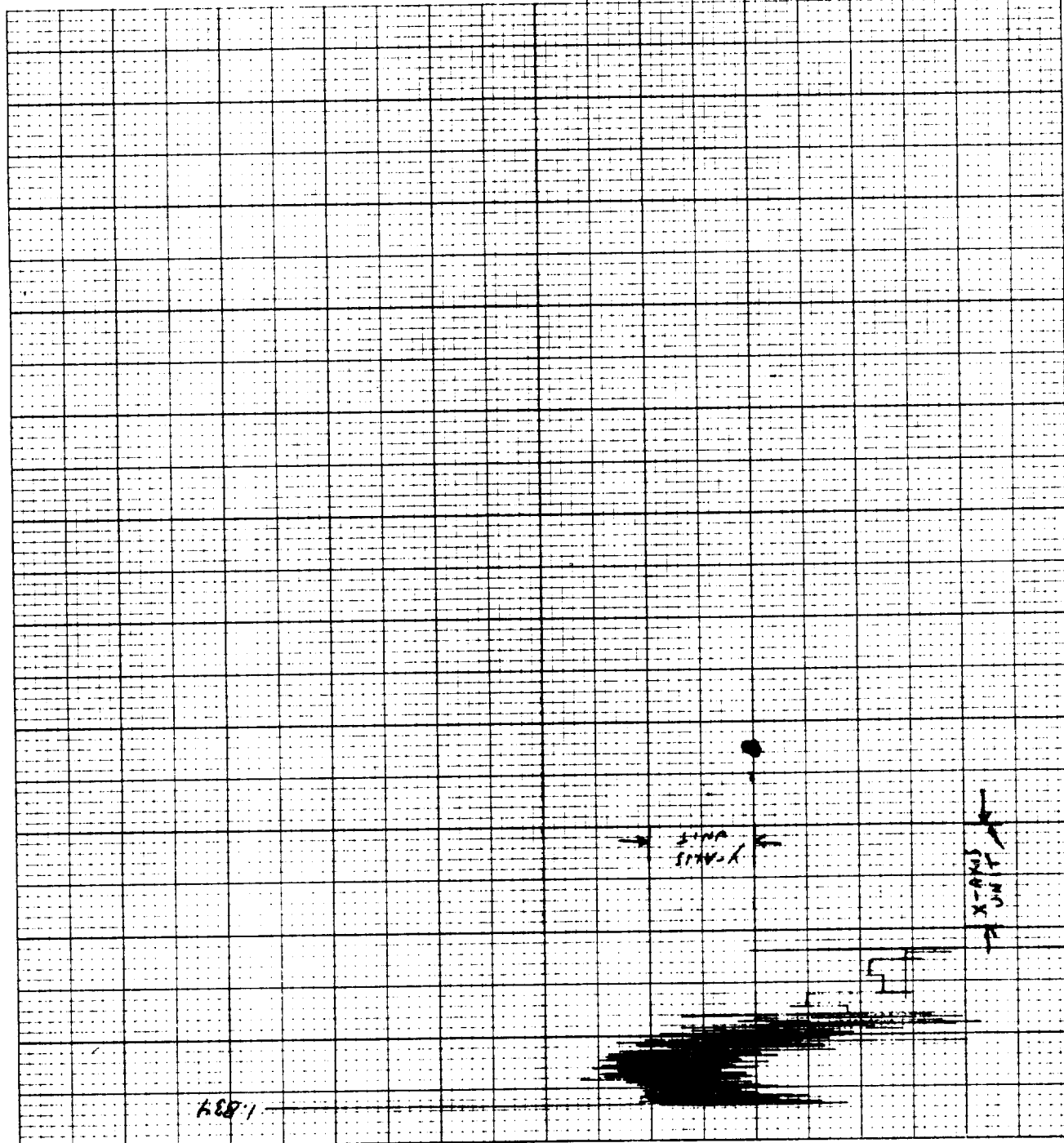
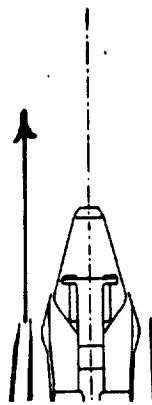
DATE: 6/7/83	NOZZLE: TAs-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-172	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\downarrow$ - <input type="checkbox"/> ; OFFSET - $\infty$	
RADIAL REF. (C) - 6762 VOLTS	R - 77
LOCATIONS: TRAVERSE - 822.0 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.M. - <input type="checkbox"/> ; M.S. - <input type="checkbox"/>	
AXIAL REF. ( ) -	VOLTS X
LOCATIONS: TRAVERSE -	VOLTS D <sub>eq</sub>
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	

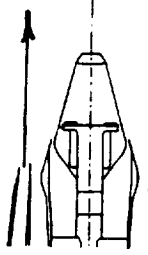


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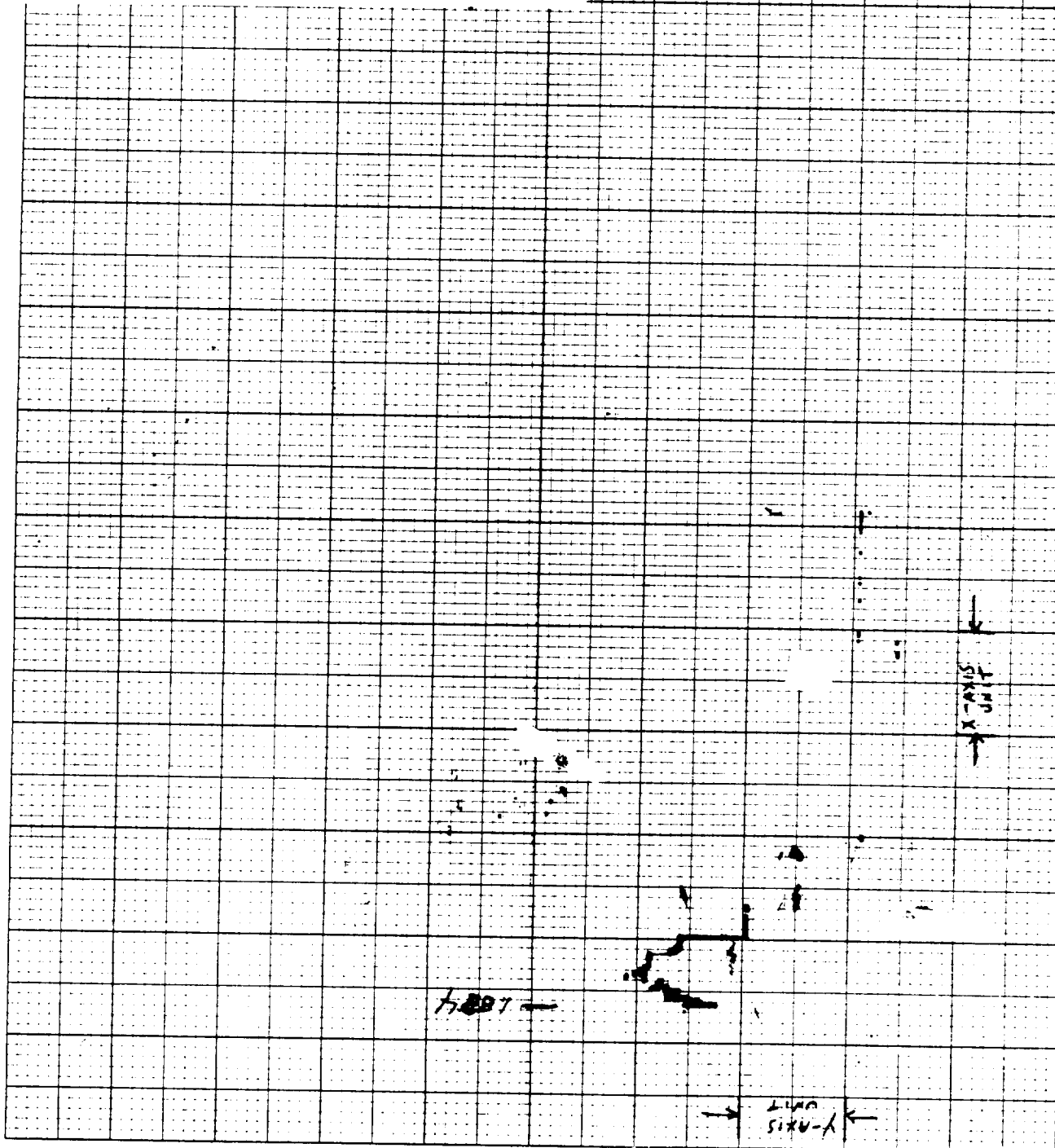


DATE: 6/7/83	NOZZLE: TAS-II
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-173	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> : OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. (C) - 6.762 VOLTS	R <sub>2</sub> - 924
LOCATIONS: TRAVERSE - 8.509 VOLTS	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS	X =
LOCATIONS: TRAVERSE - VOLTS	D <sub>eq</sub> =
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



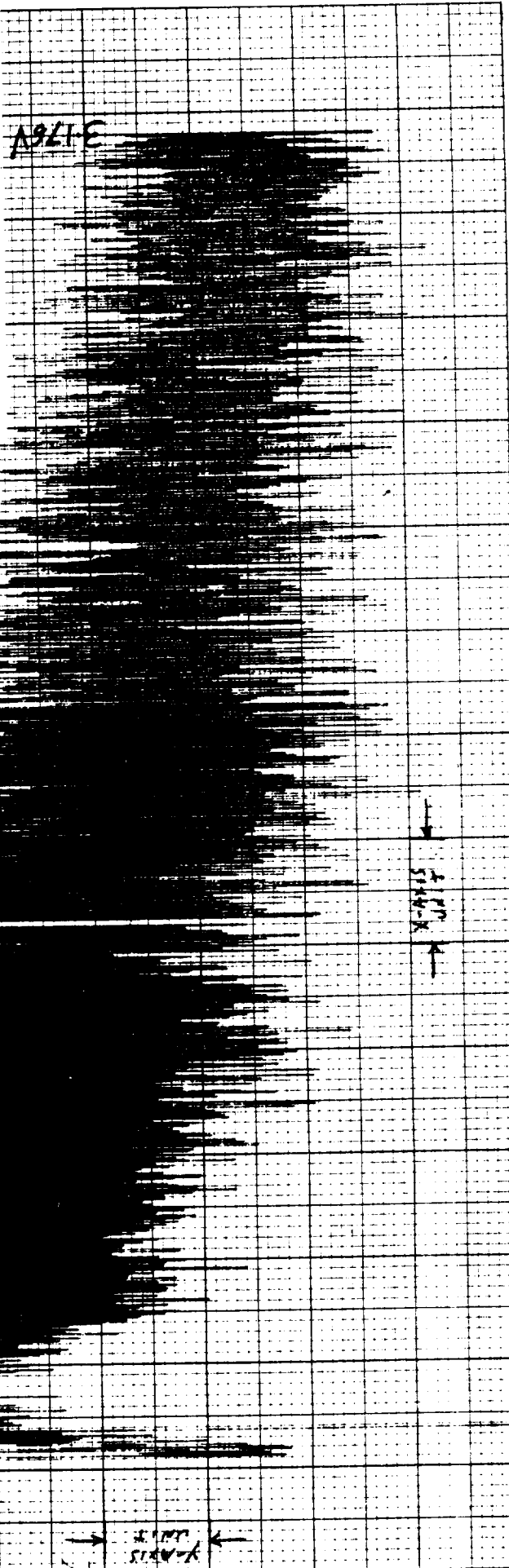
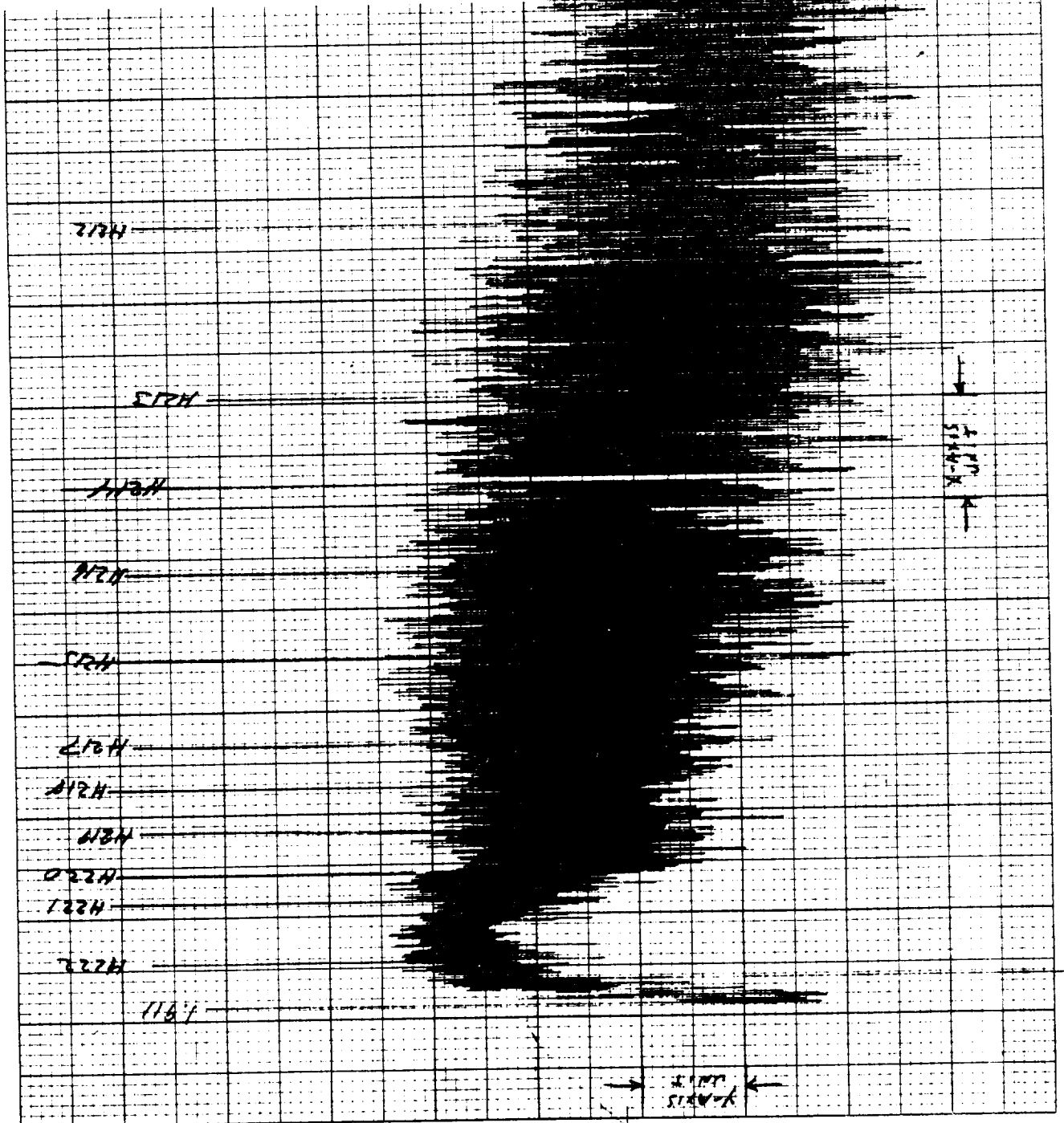
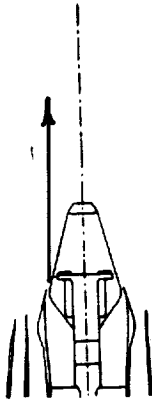
DATE: <b>6/7/83</b>	NOZZLE: <b>TAS-II</b>
TEST POINT: <b>L.V. - 1</b>	ACOUSTIC: <b>1139</b>
PLOT IDENTIFICATION: <b>G-174</b>	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> : OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. ( ) - <b>6.762 VOLTS</b> $R_2$	
LOCATIONS: TRAVERSE - <b>8.509 VOLTS</b>	
RADIAL : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - <b>VOLTS</b>	
LOCATIONS: TRAVERSE - <b>VOLTS</b>	
SCALE : X-AXIS = <b>7.20</b> INCH/UNIT	
Y-AXIS = <b>390</b> F.P.S./UNIT	
HISTOGRAMS: H- TO H-	
	

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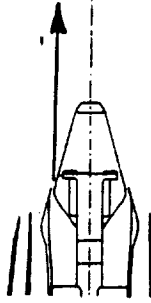


DATE: 6/7/83	NOZZLE: TAS-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-175	
TRAVERSE DETAILS.	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	RADIAL REF. (C) - 6.762 VOLTS $R_2 = 50$
LOCATIONS: TRAVERSE - 711 VOLTS $R_2$	RADIAL : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. ( ) - VOLTS $X_{eq}$	LOCATIONS: TRAVERSE - VOLTS $D_{eq}$
SCALE : X-AXIS = 7.20 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-212 TO H-223	





DATE: 6/7/83	NOZZLE: TFS-11
TEST POINT: L.V. -1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-176	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. (C) - 6762 VOLTS	R = 50
LOCATIONS: TRAVERSE - 7711 VOLTS	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) -	VOLTS $\frac{x}{d_{eq}}$
LOCATIONS: TRAVERSE -	
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



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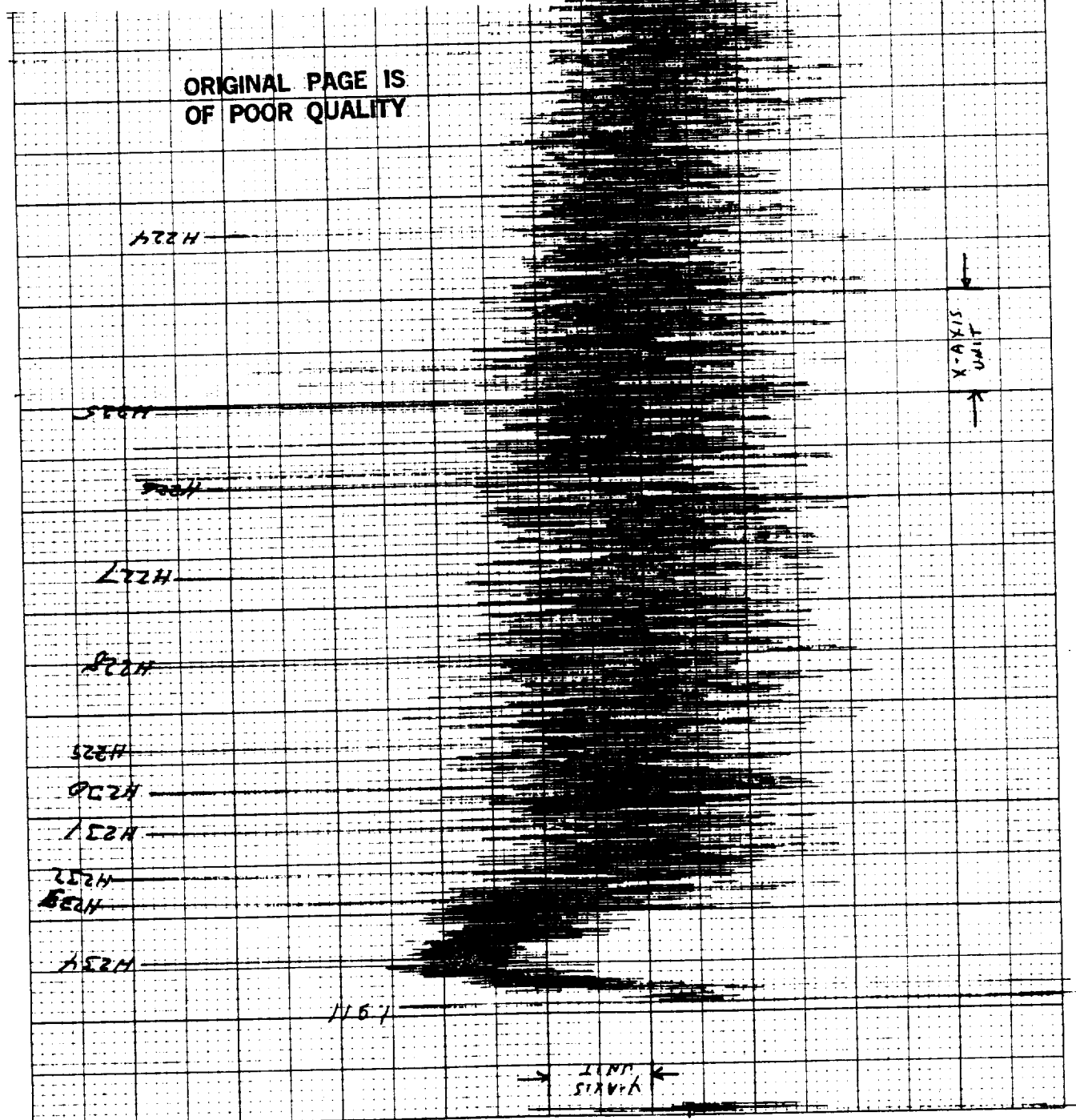
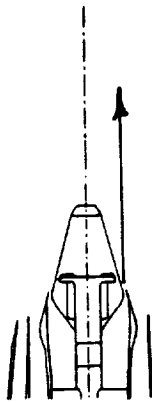
115

115

X-AXIS  
UNIT

1961-8

DATE: 6/7/83	NOZZLE: TAs-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-177	
TRAVERSE DETAILS.	
AXIAL <input checked="" type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	RADIAL REF. (C) - 6.762 VOLTS $R_2 = .50$
LOCATIONS: TRAVERSE - 5.813 VOLTS $R_2$	RADIAL <input type="checkbox"/> ; E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. ( ) - VOLTS $X_{eq}$	LOCATIONS: TRAVERSE - VOLTS $D$
SCALE: X-AXIS = 7.20 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-224 TO H-234	



DATE: 6/7/83 NOZZLE: JAS-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: G-178"

TRAVERSE DETAILS:

AXIAL ☒ : ☐ ; OFFSET - ☒

RADIAL REF. ( ) - 6.782 VOLTS  $R = .50$

LOCATIONS TRAVERSE - 5.813 VOLTS  $R = .50$

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

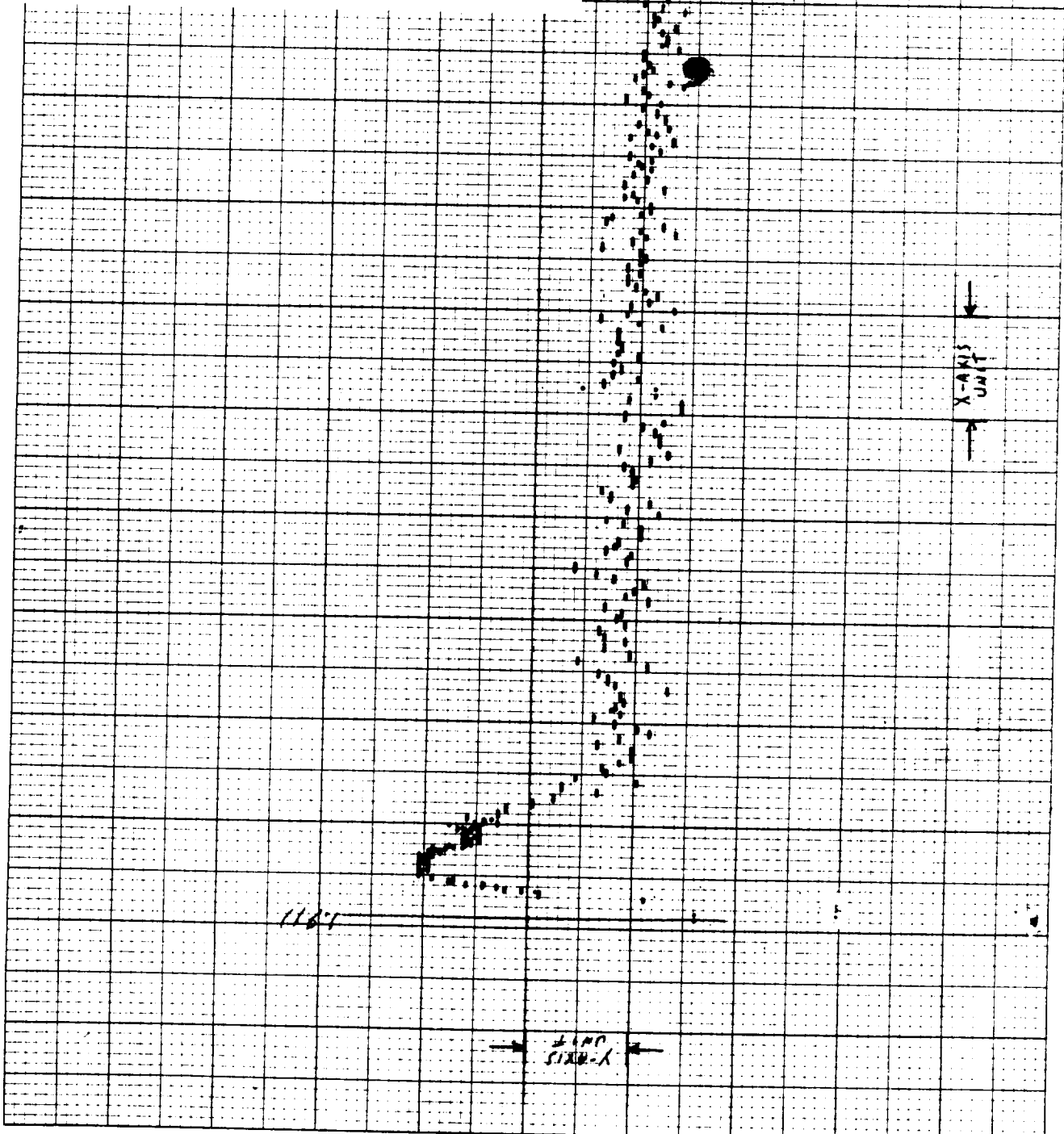
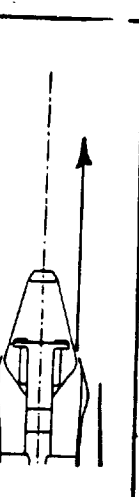
AXIAL REF. ( ) - VOLTS  $X$

LOCATIONS TRAVERSE - VOLTS  $Y$

SCALE : X-AXIS = 7.20 INCH/UNIT

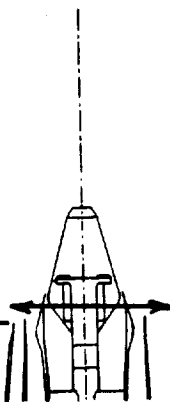
Y-AXIS = 3.90 F.P.S./UNIT

HISTOGRAMS: H- TO H-





DATE: 6/7/83	NOZZLE: TAS-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: 6-182	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS R =
LOCATIONS: TRAVERSE -	VOLTS R <sub>2</sub> =
RADIAL <input checked="" type="checkbox"/> : E.W. - 10 ; N.S. - <input type="checkbox"/>	AXIAL REF. (A) - 1834 VOLTS X = 150
LOCATIONS: TRAVERSE - 1876 VOLTS D = 150	
SCALE: X-AXIS = 3.317 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H- TO H-	



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X-AXIS  
UNIT

1139  
1139



DATE: 6/7/83 NOZZLE: TAs-11

TEST POINT: L.V. - 1 : ACOUSTIC - 1139

PLOT IDENTIFICATION: 6-184

TRAVERSE DETAILS.

AXIAL ☐ :  $\phi$  - ☐ : OFFSET - ☐

RADIAL REF. ( $\phi$ ) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL  $\phi$  : E.W. -  $\phi$  : N.S. - ☐

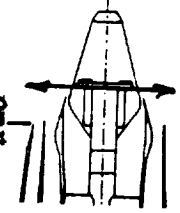
AXIAL REF. (200) - 1834 VOLTS  $X = 1.0$

LOCATIONS: TRAVERSE - 1917 VOLTS  $D_{eq}$

SCALE: X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-



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X-AXIS  
UNIT

1.784  
3.184 = X

DATE: 6/7/83 NOZZLE: T4S-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: 6 - 185

TRAVERSE DETAILS:

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (X00) - 1.834 VOLTS  $X_{deg}$

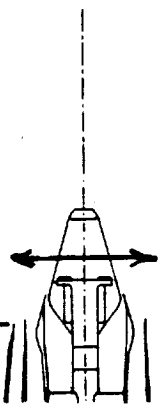
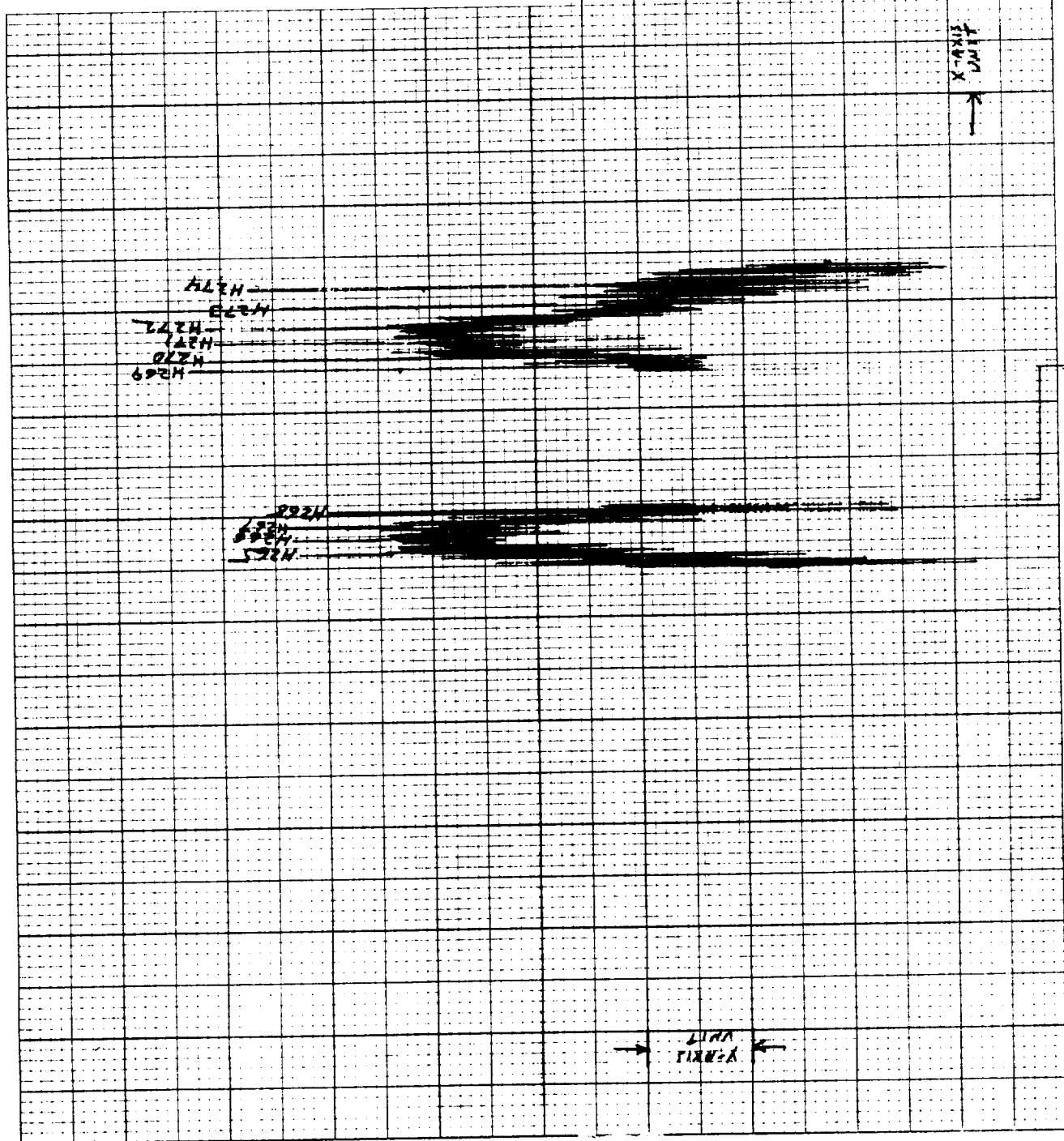
LOCATIONS: TRAVERSE - 1.959 VOLTS  $X_{deg}$

SCALE: X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-265 TO H-274

X=0



DATE: **6/7/83** NOZZLE: **TAS-11**

TEST POINT: **L.V. - 1** ; ACOUSTIC - **1139**

PLOT IDENTIFICATION: **6-1876**

TRAVERSE DETAILS:

AXIAL ☐ : ☒ : OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R =$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. **0.0** - **1.834** VOLTS  $X_{eq} = 1.5$

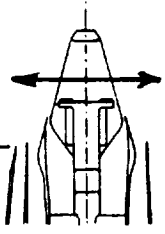
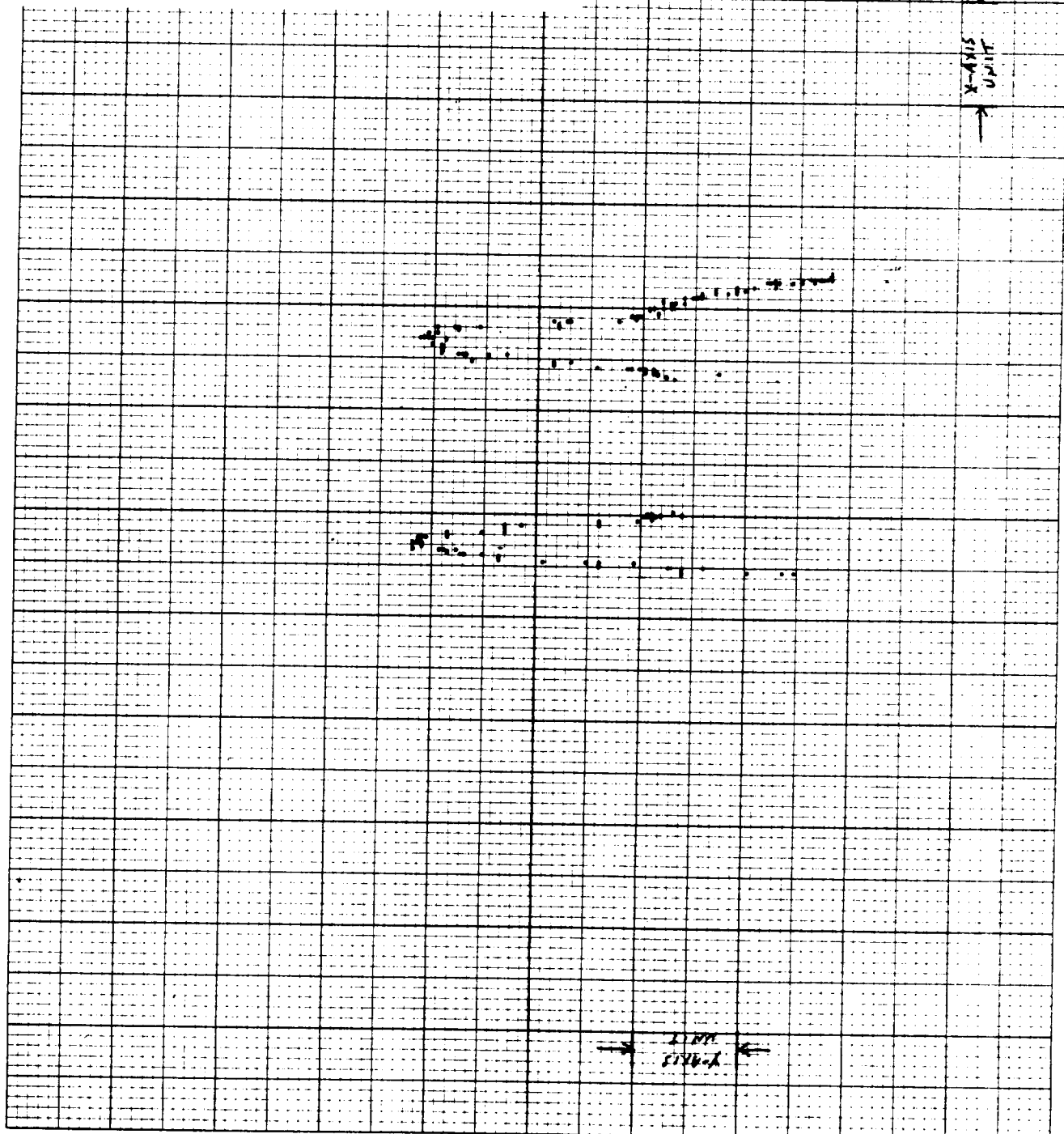
LOCATIONS: TRAVERSE - **1.959** VOLTS  $Y_{eq}$

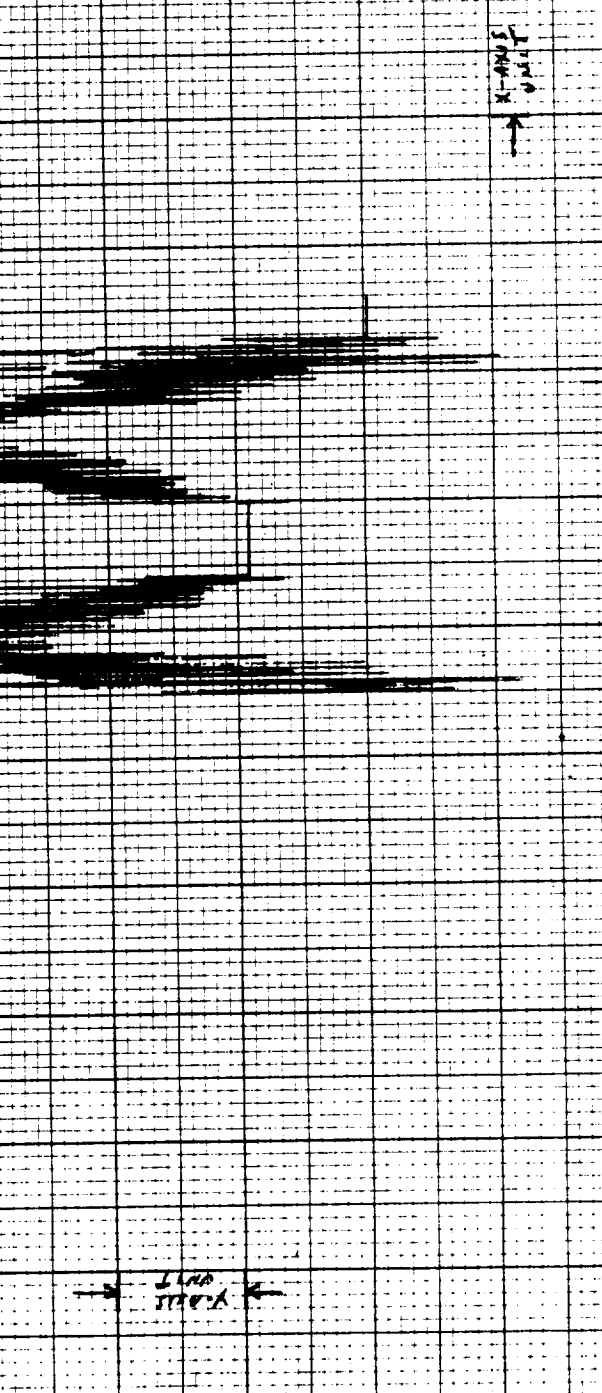
SCALE: X-AXIS = **3.317** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

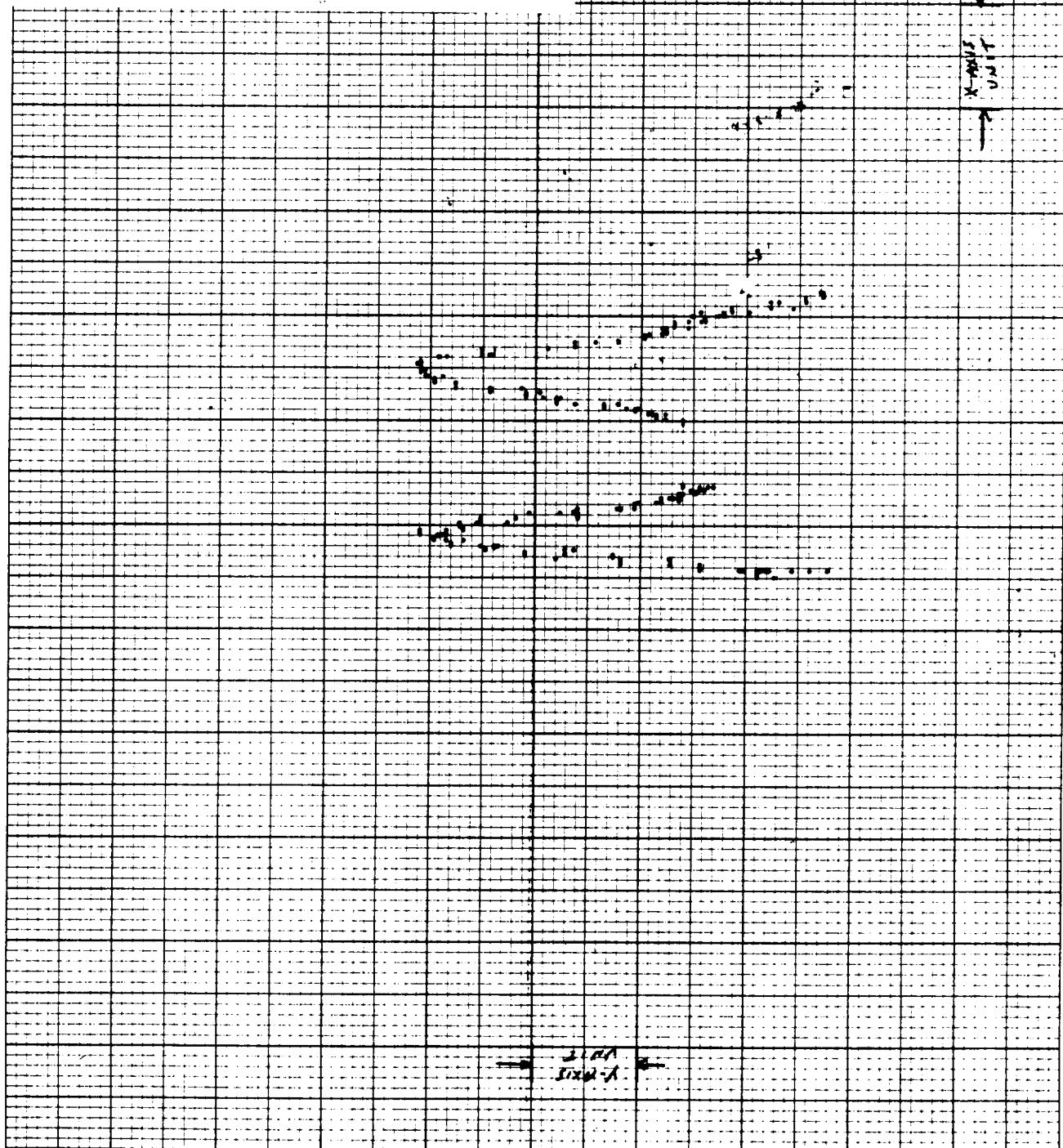
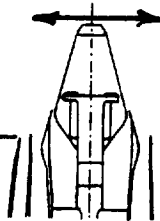
HISTOGRAMS: H- TO H-

**X=0**

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DATE: 6/7/83	NOZZLE: T4S-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: 6-188	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	RADIAL REF. ( $\phi$ ) - VOLTS $R_1$
LOCATIONS: TRAVERSE -	VOLTS $R_2$
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. 000 - 1.834 VOLTS $X_D$	22
LOCATIONS: TRAVERSE -	VOLTS $D_{eq}$
SCALE: X-AXIS= 3.317 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: **6/7/83** NOZZLE: **TAS-11**

TEST POINT: L.V. - I ; ACOUSTIC - **1139**

PLOT IDENTIFICATION : **6-189**

TRAVERSE DETAILS:

AXIAL ☐ : ☐ : OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. **080-1834** VOLTS  $X_{30}$


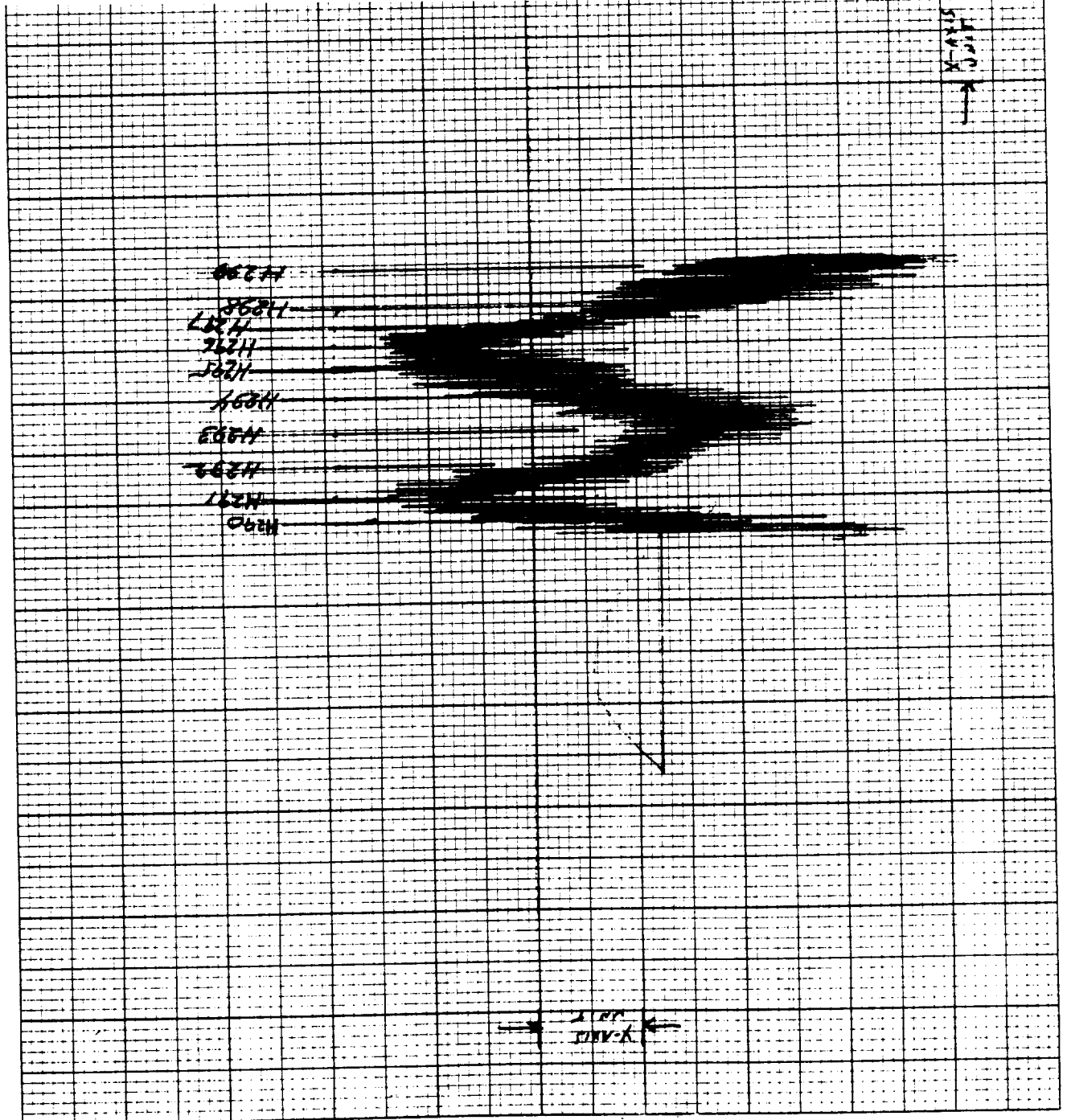
LOCATIONS: TRAVERSE - **2084** VOLTS  $Y_{60}$

SCALE : X-AXIS = **3.317** INCH/UNIT

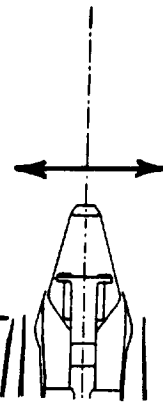
Y-AXIS = **390** F.P.S./UNIT

HISTOGRAMS: H-**290** TO H-**299**

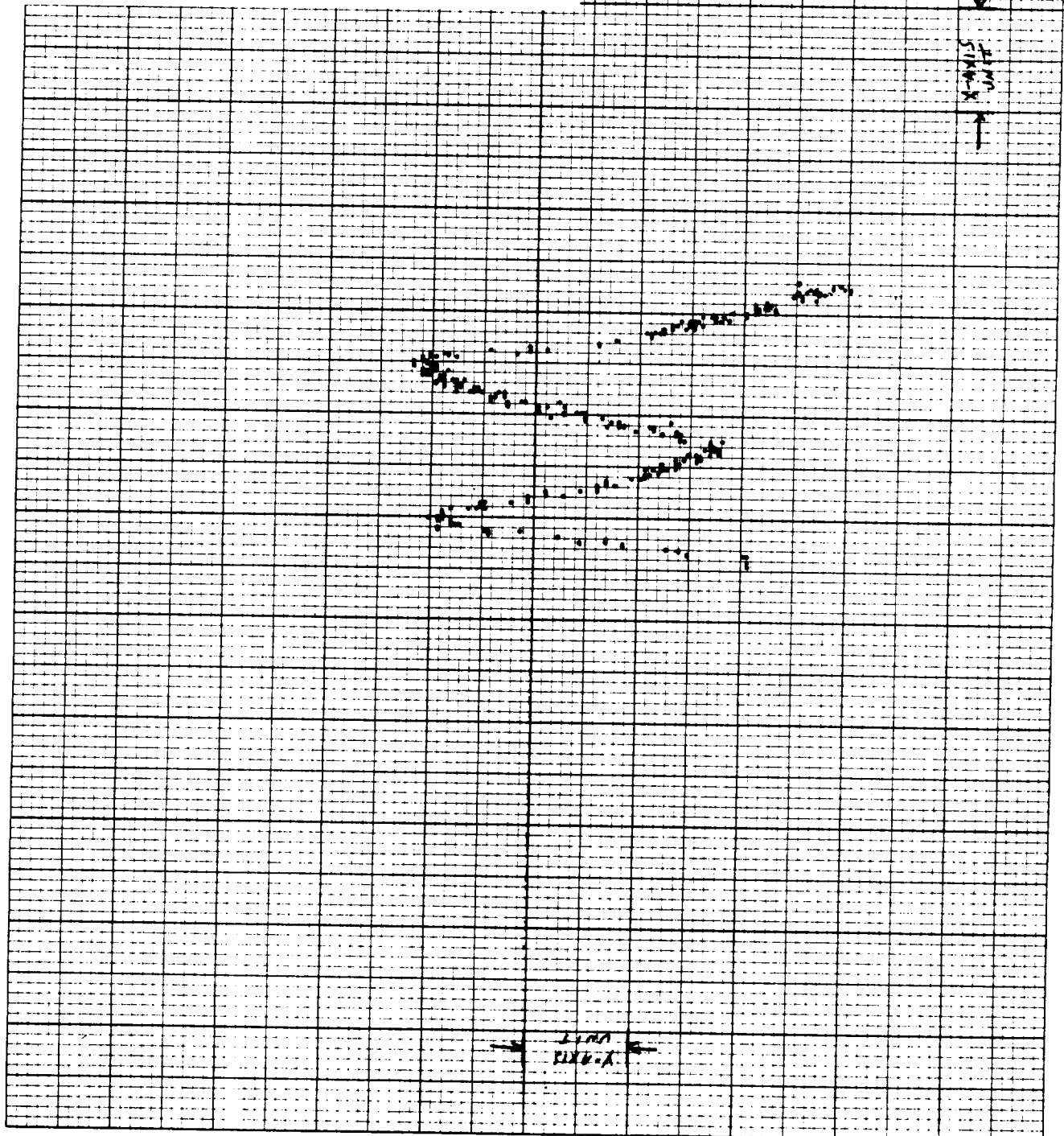
$X=0$

DATE: 6/7/83	NOZZLE: THS-11
TEST POINT: L.V. - 1 ; ACOUSTIC - 1139	
PLOT IDENTIFICATION: 6 - 190	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_2$
LOCATIONS: TRAVERSE -	RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. (X) - 1834 VOLTS $X_{eq}$	LOCATIONS: TRAVERSE 2.884 VOLTS $D_{eq}$
SCALE: X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



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DATE: 6/7/83 NOZZLE: 7AS-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: G-191

TRAVERSE DETAILS.

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $\frac{R}{R_2}$

LOCATIONS: TRAVERSE -

RADIAL  $\Delta$  : E.W. -  $\Delta$  ; N.S. - ☐

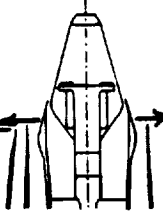
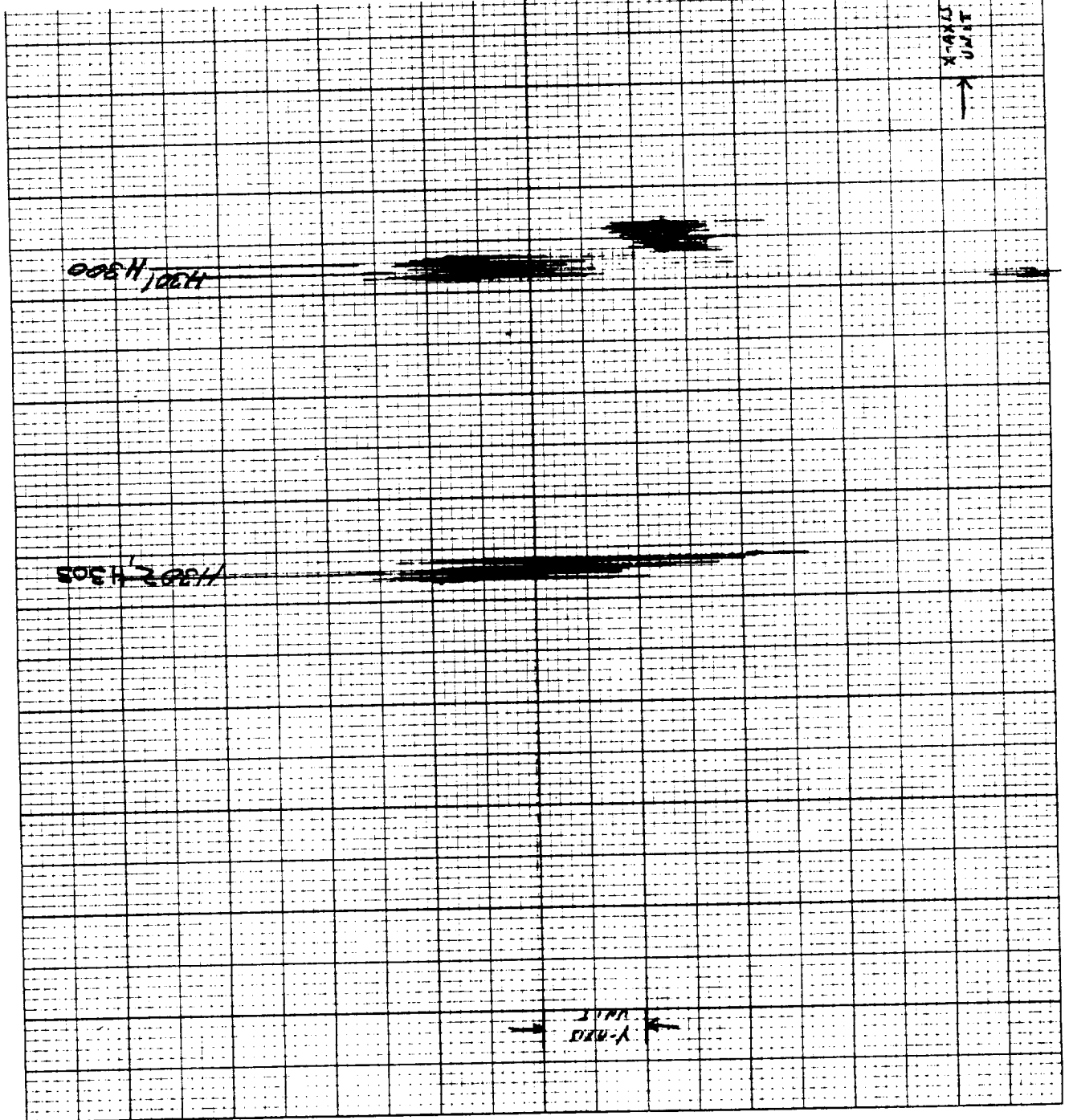
AXIAL REF. (X-0) - 1834 VOLTS  $\frac{X}{X_{eq}}$

LOCATIONS: TRAVERSE - 1855 VOLTS

SCALE : X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-300 TO H-303

DATE: 6/7/83 NOZZLE: 775-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: G-192

TRAVERSE DETAILS:

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R -

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

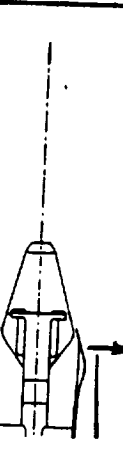
AXIAL REF. (X-0) - 1.834 VOLTS X - 21

LOCATIONS: TRAVERSE - 1.851 VOLTS D -

SCALE : X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-



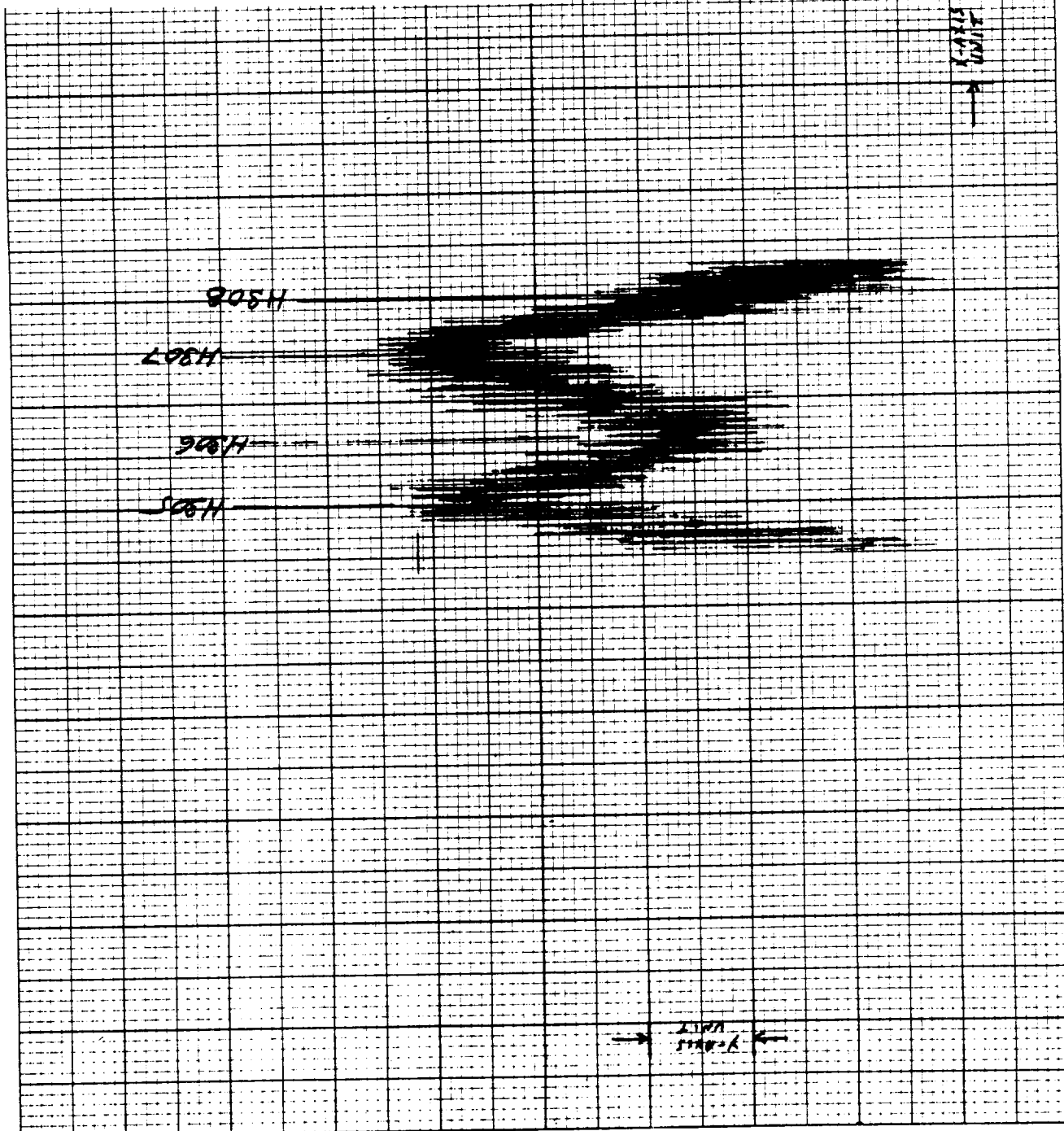
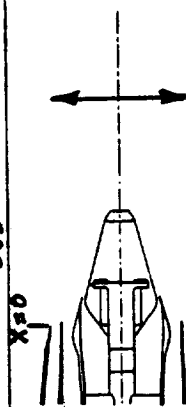
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X-AXIS

X-AXIS



DATE: 6/7/83	NOZZLE: T4S-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: 6-195	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	
RADIAL REF. (C) - VOLTS $R_1$	
LOCATIONS: TRAVERSE - VOLTS $R_2$	
RADIAL $X$ : E.W. - $W$ : N.S. - <input type="checkbox"/>	
AXIAL REF. (C) - VOLTS $X$ - 40	
LOCATIONS: TRAVERSE - 2.167 VOLTS $D_{eq}$	
SCALE : X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H-305 TO H-308	





DATE: 6/2/83 NOZZLE: T45-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: 6-196

TRAVERSE DETAILS:

AXIAL ☐ : ☐ - ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $\frac{R}{R_2}$

LOCATIONS: TRAVERSE -

RADIAL (X) : E.W. - ☒ ; N.S. - ☐

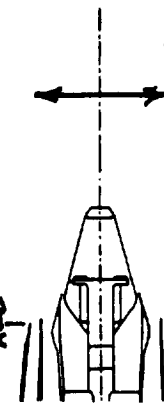
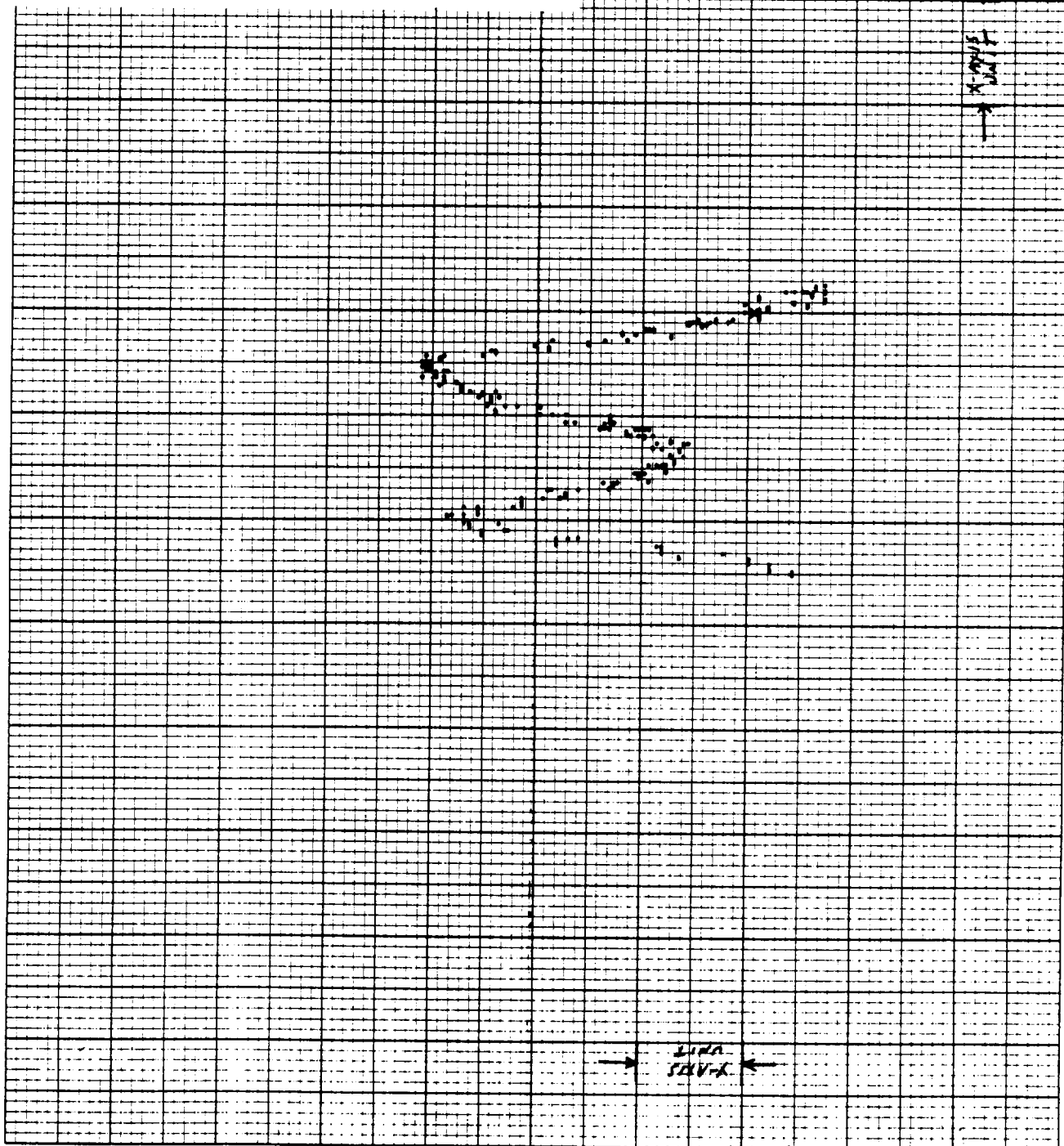
AXIAL REF. (K-0) - 1.884 VOLTS  $\frac{X}{D_{eq}}$

LOCATIONS: TRAVERSE - 2.167 VOLTS

SCALE : X-AXIS: 3.317 INCH/UNIT

Y-AXIS: 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

DATE: 5/2/83 NOZZLE: T45-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: 6 - 197

TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL  $R_1$  : E.W. - 1A ; N.S. - ☐

AXIAL REF. (000) - 1.834 VOLTS  $X_{eq}$

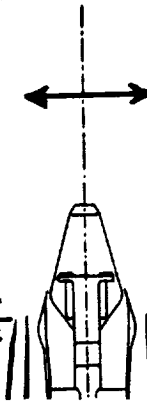
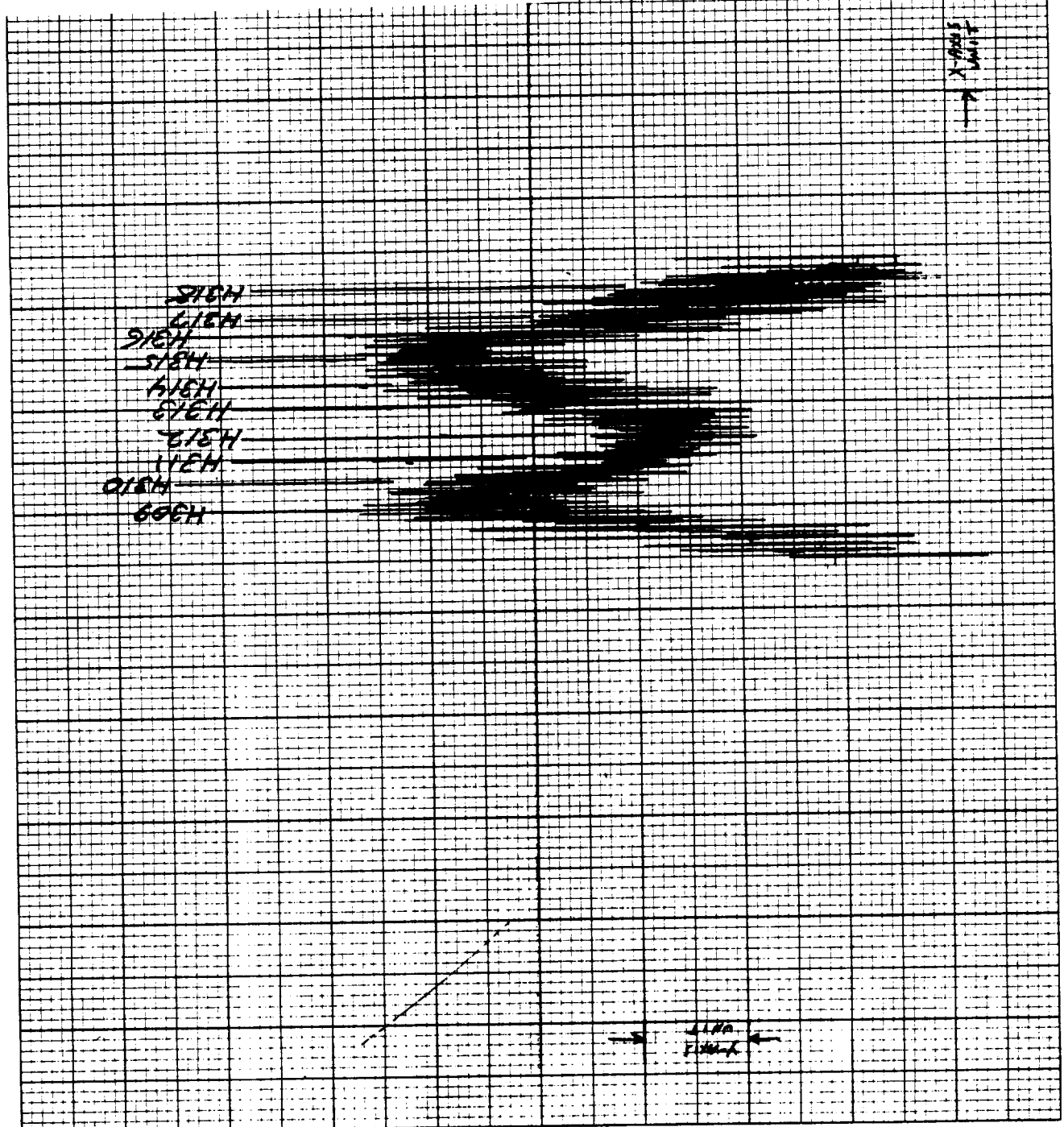
LOCATIONS: TRAVERSE - 1.167 VOLTS  $Y_{eq}$

SCALE : X-AXIS = 3.317 INCH/UNIT

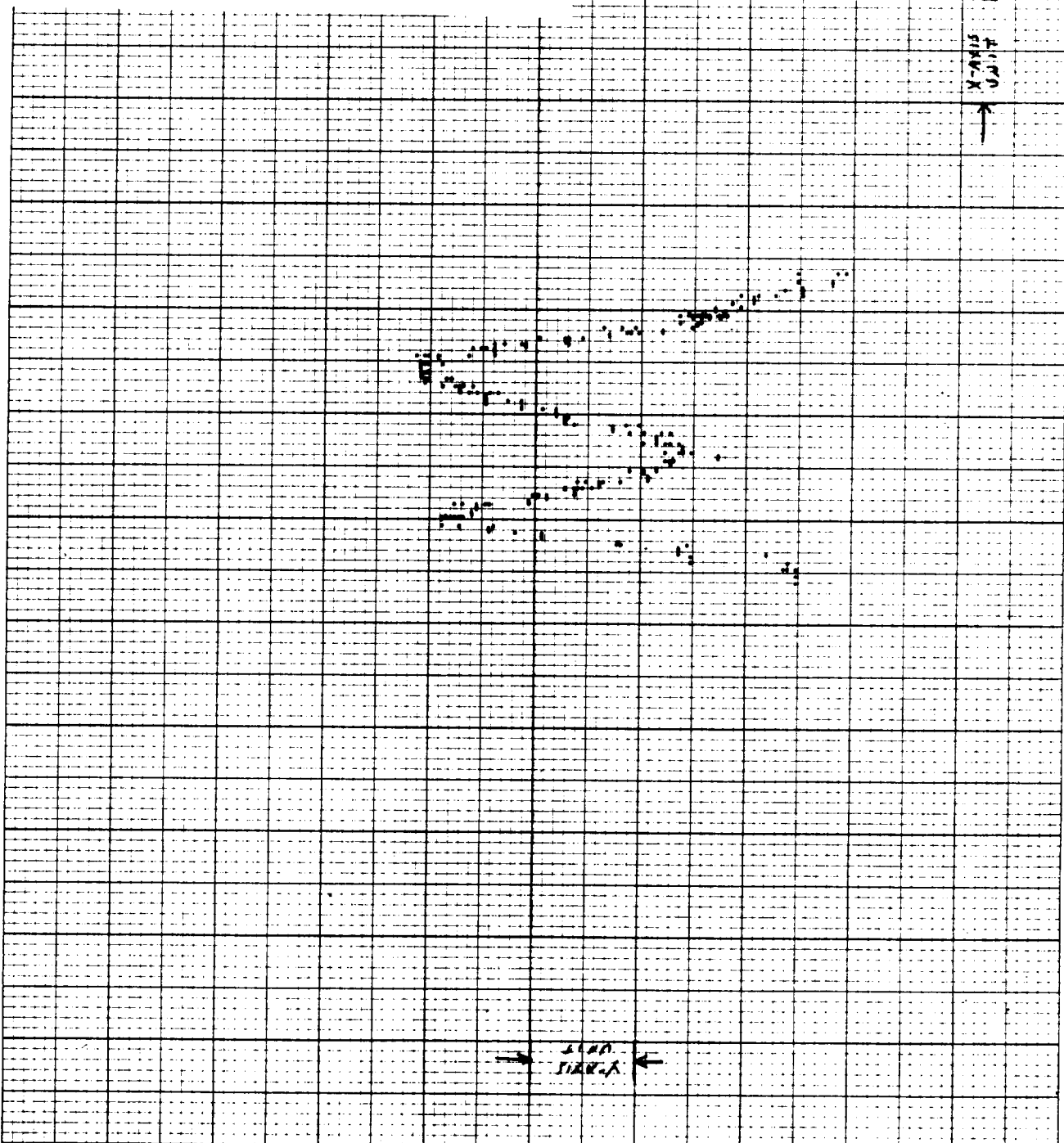
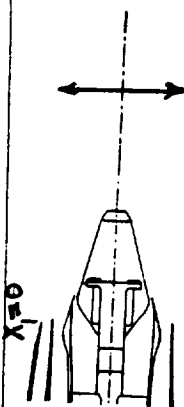
Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-309 TO H-318

XPO

DATE: 6/7/83	NOZZLE: THS-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-198	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : $\downarrow$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_1$ - <input type="checkbox"/>
LOCATIONS: TRAVERSE - VOLTS $R_2$ - <input type="checkbox"/>	RADIAL $\times$ : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. (X) - VOLTS $X$ - 40	LOCATIONS: TRAVERSE - VOLTS $D$ - 40
SCALE : X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: **6/7/83** NOZZLE: **JAS-11**

TEST POINT: L.V. - **1** ; ACOUSTIC - **1139**

PLOT IDENTIFICATION: **G-199**

TRAVERSE DETAILS.

AXIAL ☐ ☒ ; OFFSET ☐ ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (X-0) **1.834** VOLTS  $X_{deg}$

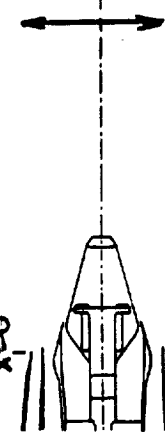
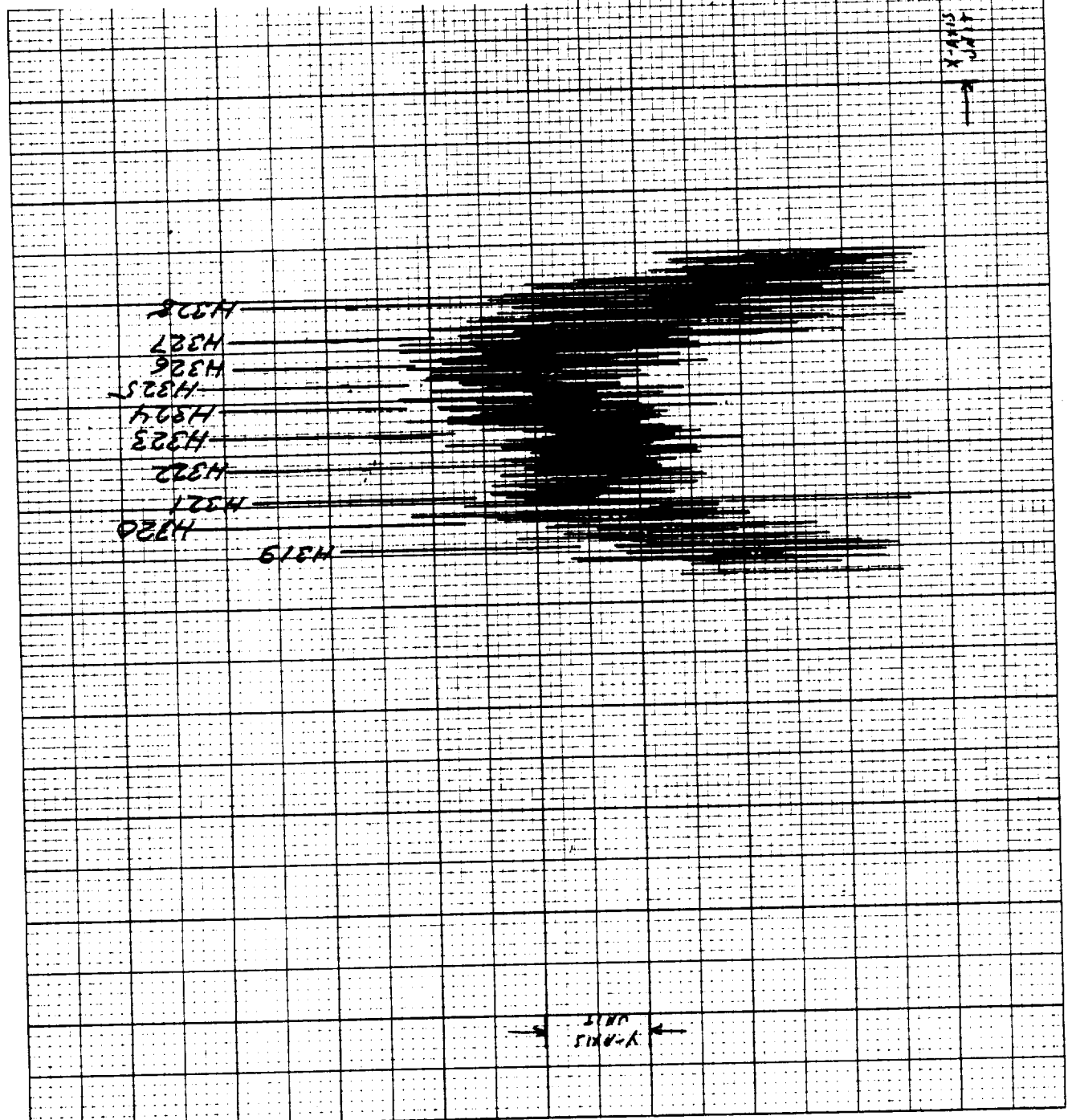
LOCATIONS: TRAVERSE **2.494** VOLTS  $D_{deg}$

SCALE: X-AXIS: **3.317** INCH/UNIT

Y-AXIS: **390** F.P.S./UNIT

HISTOGRAMS: H-**319** TO H-**328**

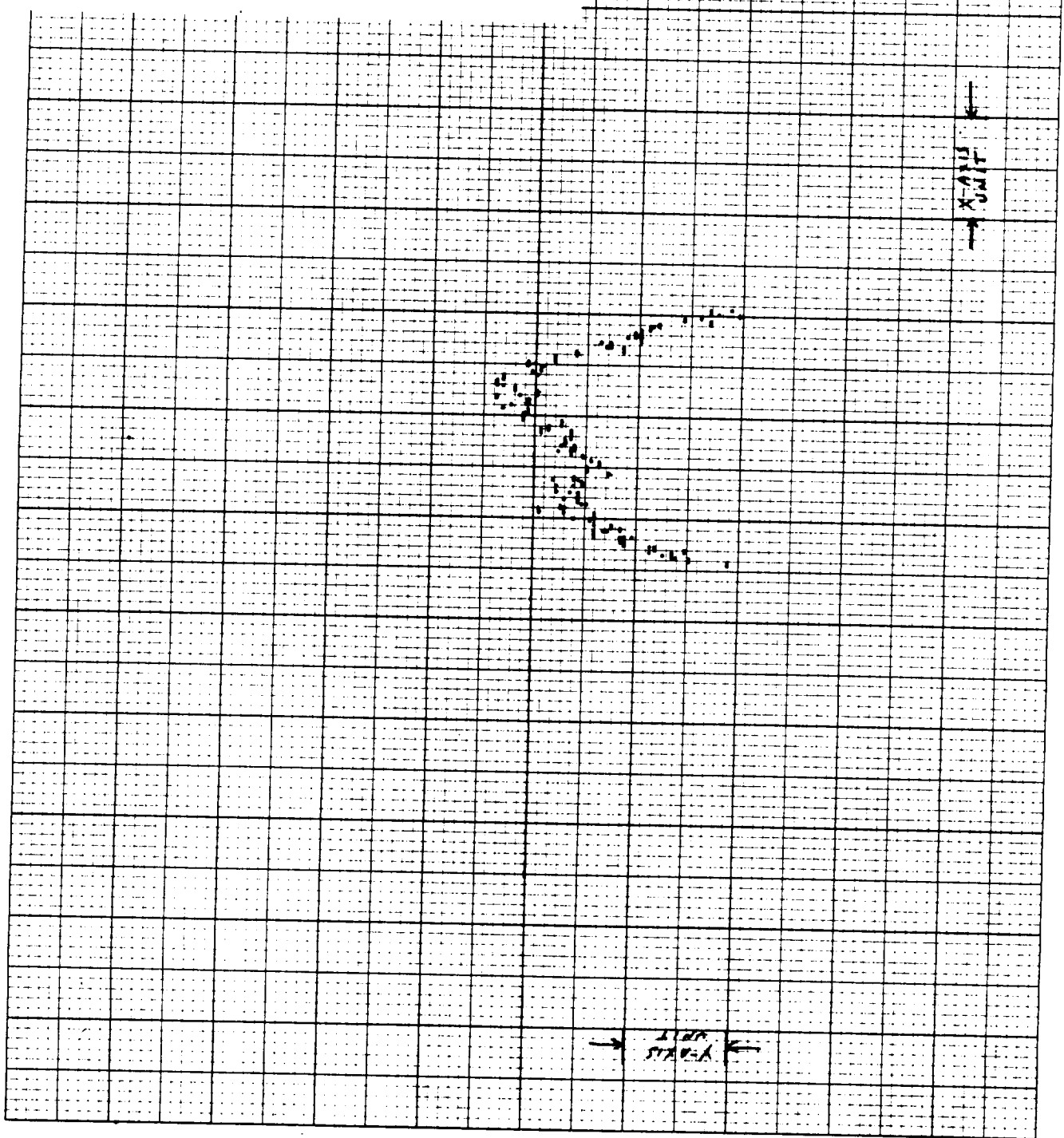
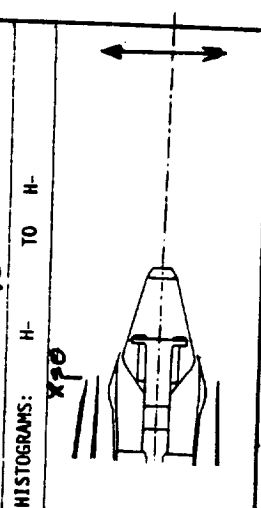
**X=0**

DATE: 6/8/83 NOZZLE: TAs-11  
 TEST POINT: L.V. - ; ACOUSTIC - 1139  
 PLOT IDENTIFICATION: G-201

TRAVERSE DETAILS:  
 AXIAL ☐ : ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R -  
 LOCATIONS: TRAVERSE - VOLTS R -  
 RADIAL X: E.W. - 10 ; N.S. - ☐  
 AXIAL REF. (200) - 1.834 VOLTS X 8.4  
 LOCATIONS: TRAVERSE - 2.499 VOLTS D<sub>eq</sub>

SCALE: X-AXIS=3.317 INCH/UNIT  
 Y-AXIS=390 F.P.S./UNIT



DATE: **6/8/83** NOZZLE: **TAS-11**

TEST POINT: **L.V. - 1** ; ACOUSTIC - **1139**

PLOT IDENTIFICATION: **G-202**

TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. **0.00** - **1.834** VOLTS  $X = 10.0$

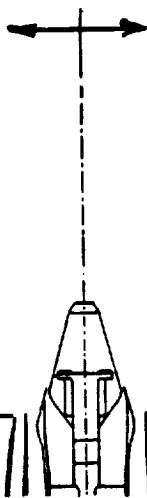
LOCATIONS: TRAVERSE - **2.665** VOLTS  $D_{eq}$

SCALE: X-AXIS: **3.317** INCH/UNIT

Y-AXIS: **390** F.P.S./UNIT

HISTOGRAMS: **H-329** TO **H-334**

$X=0$



**H-329**

**H-330**

**H-331**

**H-332**

**H-333**

**H-334**

**Y-AXIS**



DATE: 6/8/83 NOZZLE: JAS-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: 6-203

TRAVERSE DETAILS:

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (S-O) - 1.824 VOLTS  $X$

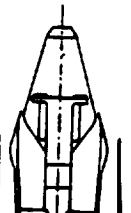
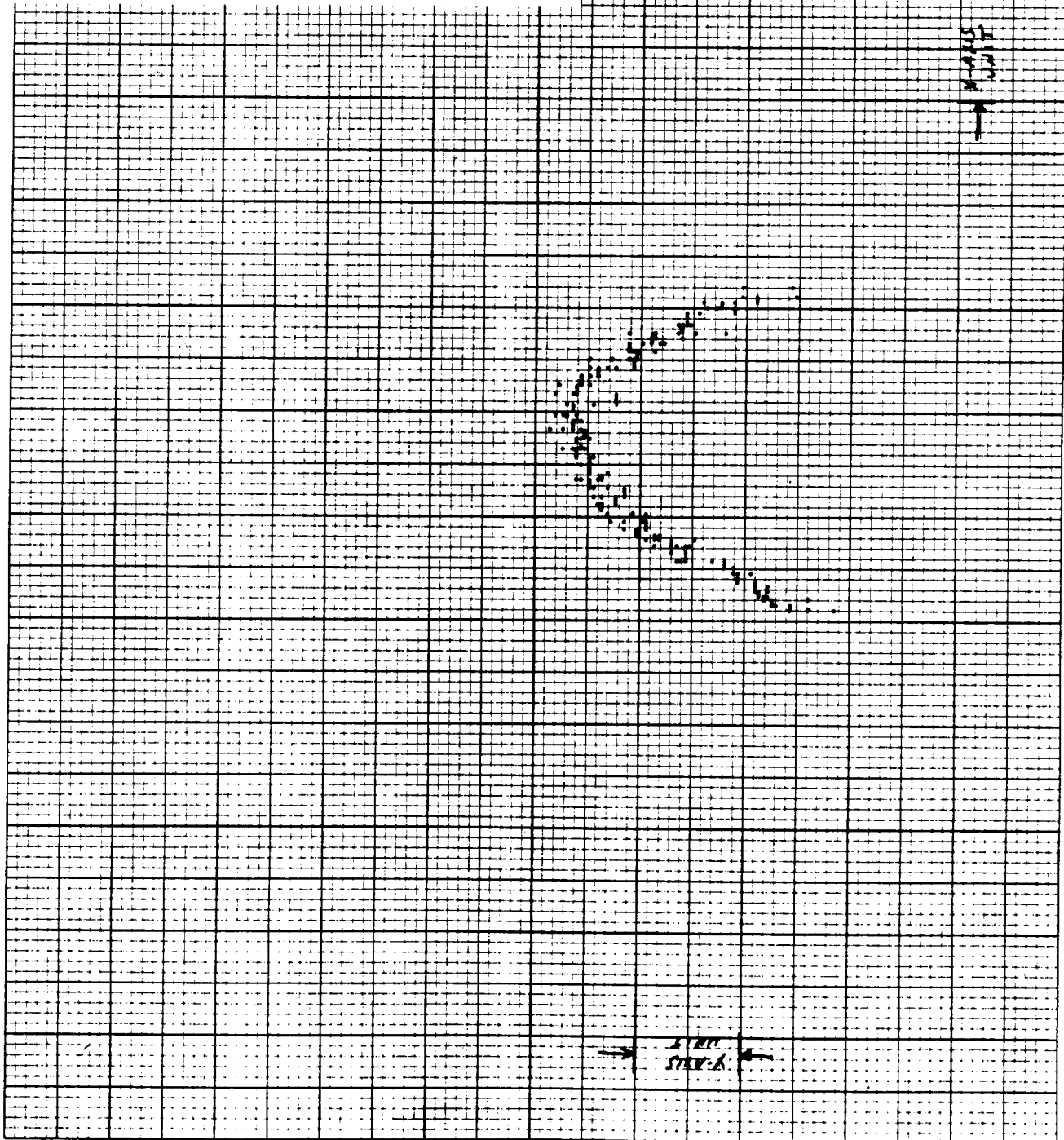
LOCATIONS: TRAVERSE - 2.665 VOLTS  $X_{eq}$

SCALE : X-AXIS= 3.317 INCH/UNIT

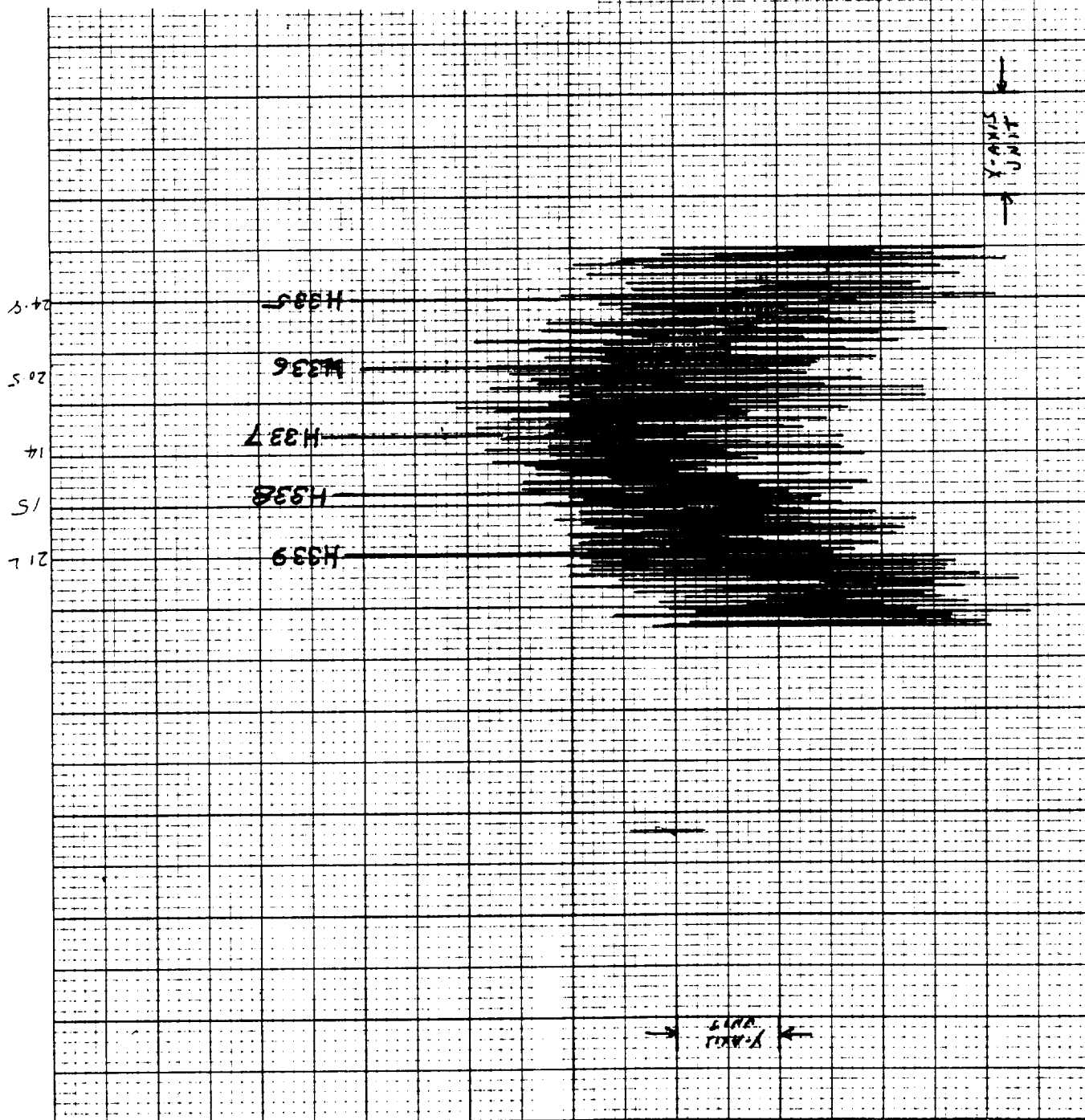
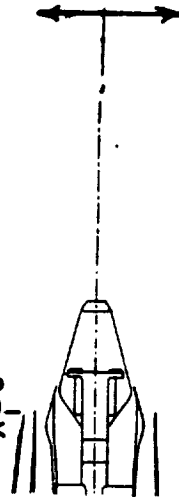
Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

$X=0$

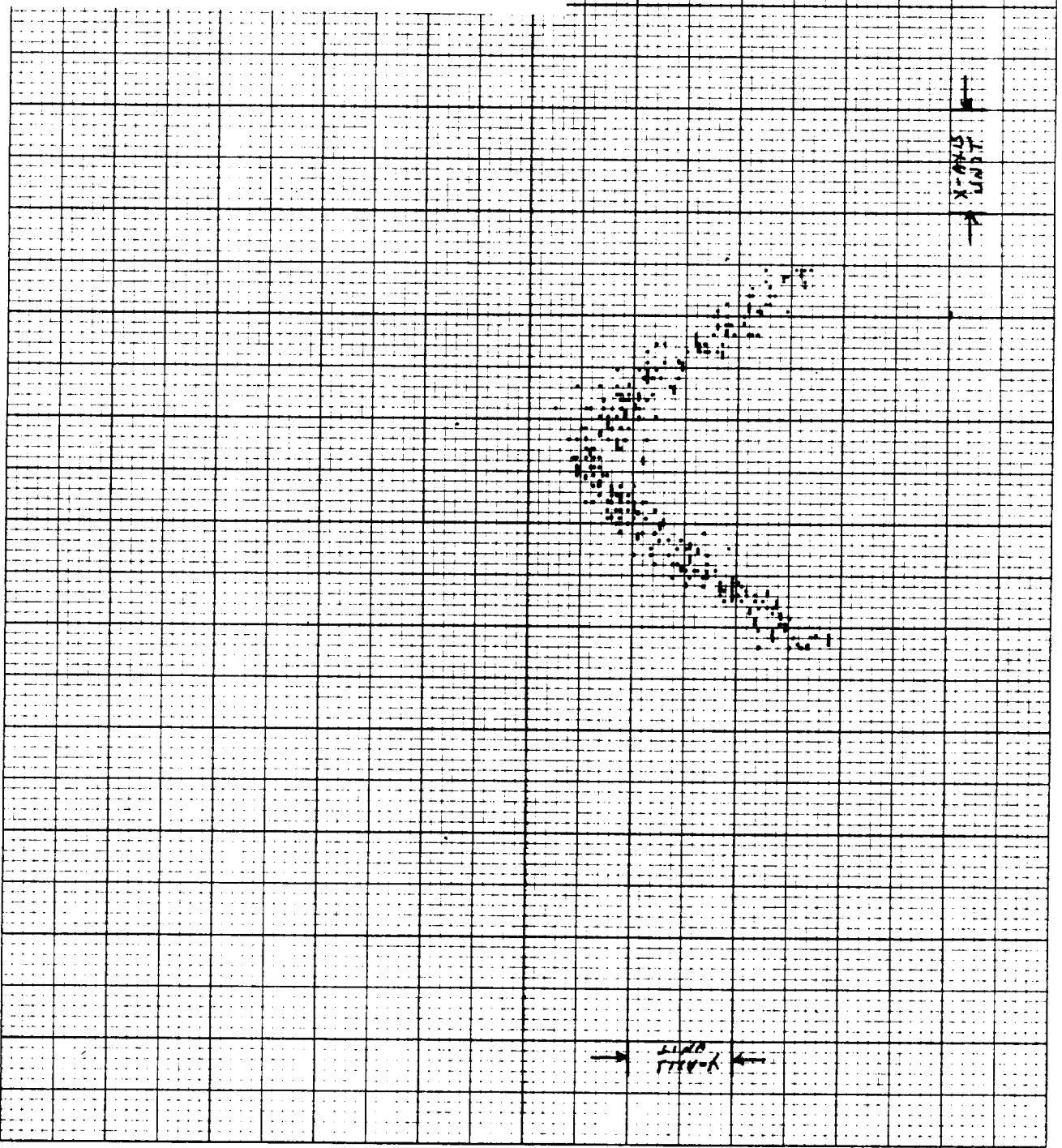
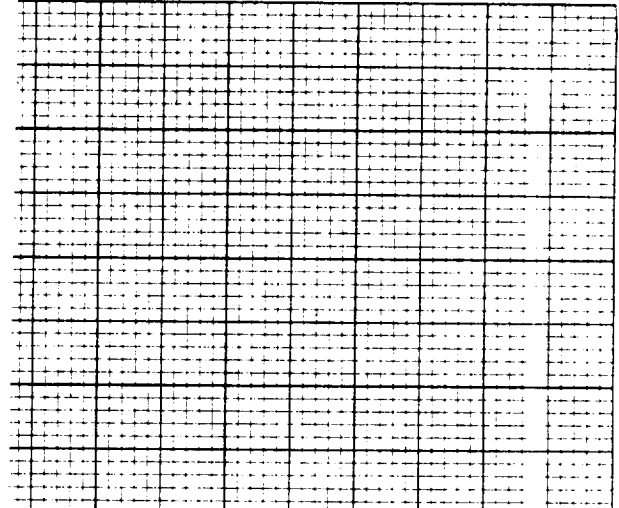
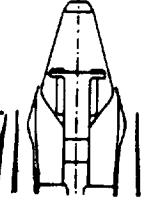
DATE: 6/8/83	NOZZLE: TAS-11
TEST POINT: L.V. - 1	ACOUSTIC - 1139
PLOT IDENTIFICATION: G-204	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; VOLTAGE - <input type="checkbox"/>
LOCATIONS: REF. (C) -	LOCATIONS: REF. (C) -
RADIAL <input checked="" type="checkbox"/> : E.W. - 10 ; N.S. - <input type="checkbox"/>	RADIAL <input checked="" type="checkbox"/> : E.W. - 10 ; N.S. - <input type="checkbox"/>
AXIAL, REF. X-0.1-834 VOLTS X = 12.0	AXIAL, REF. X-0.1-834 VOLTS X = 12.0
LOCATIONS: TRAVERSE - 2.83, VOLTS D <sub>eq</sub>	LOCATIONS: TRAVERSE - 2.83, VOLTS D <sub>eq</sub>
SCALE: X-AXIS = 3.317 INCH/UNIT	SCALE: X-AXIS = 3.317 INCH/UNIT
Y-AXIS = 390 F.P.S./UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-335 TO H-339	HISTOGRAMS: H-335 TO H-339





DATE: 6/8/83	NOZZLE: T45-11
TEST POINT: L.V. - 1 ; ACOUSTIC - 1139	
PLOT IDENTIFICATION: G-205	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET <input type="checkbox"/>	
RADIAL: REF. (C) -	VOLTS R
LOCATIONS: TRAVERSE -	VOLTS R <sub>2</sub>
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL: REF. (X-0-1-834 VOLTS)	X
LOCATIONS: TRAVERSE (2-831 VOLTS)	0 <sub>eq</sub>
SCALE: X-AXIS= 3-317 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	

X=0



DATE: 6/8/83 NOZZLE: TAS-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: G-206

TRAVERSE DETAILS:

AXIAL ☐ ☒ ; OFFSET ☐ - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ ; E.W. - ☒ ; N.S. - ☐

AXIAL REF. 0-0-1.834 VOLTS  $X$  610

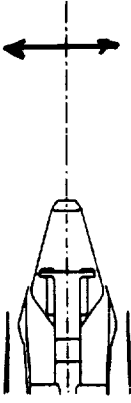
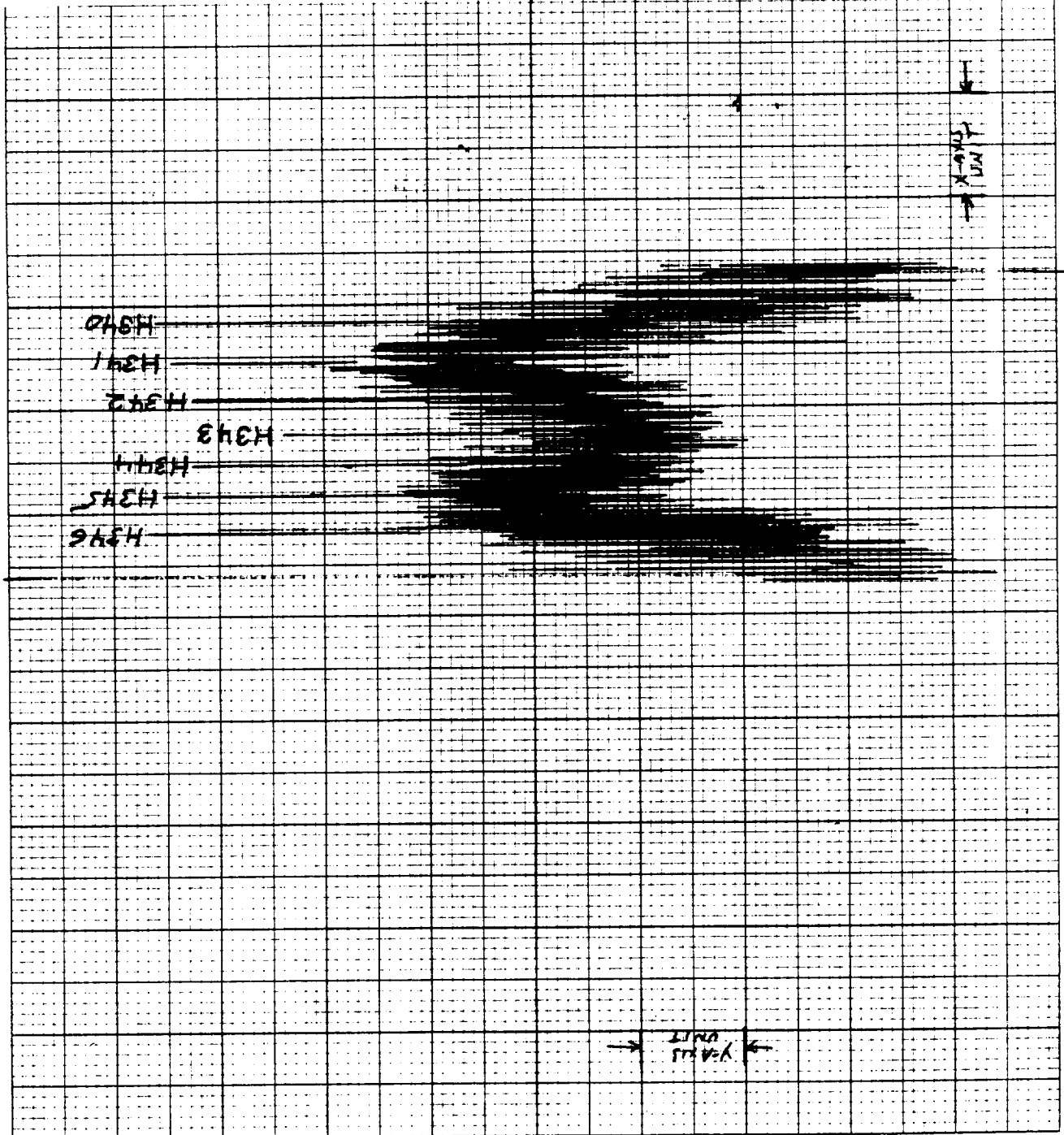
LOCATIONS: TRAVERSE - 2334 VOLTS  $\theta$  deg

SCALE: X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

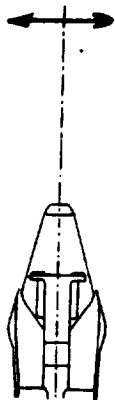
HISTOGRAMS: H-340 TO H-346

$X=0$

DATE: <b>6/8/83</b>	NOZZLE: <b>TAS-11</b>
TEST POINT: <b>L.V. - 1 ; ACOUSTIC - 1139</b>	
PLOT IDENTIFICATION: <b>G-207</b>	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> - <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	
RADIAL, REF. (C) -	VOLTS $R =$
LOCATIONS, TRAVERSE -	VOLTS $R_2$
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL LOCATIONS, TRAVERSE -	REF. <b>1834</b> VOLTS $X = 60$
	<b>2334</b> VOLTS $\theta_{eq}$
SCALE : X-AXIS = <b>3.317</b> INCH/UNIT	
Y-AXIS = <b>390</b> F.P.S./UNIT	
HISTOGRAMS: H- TO H-	

$X=0$



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OF POOR QUALITY

X-AXIS  
UNIT

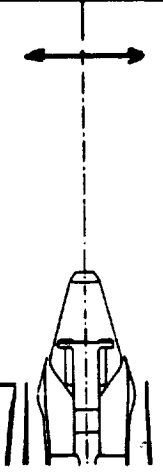
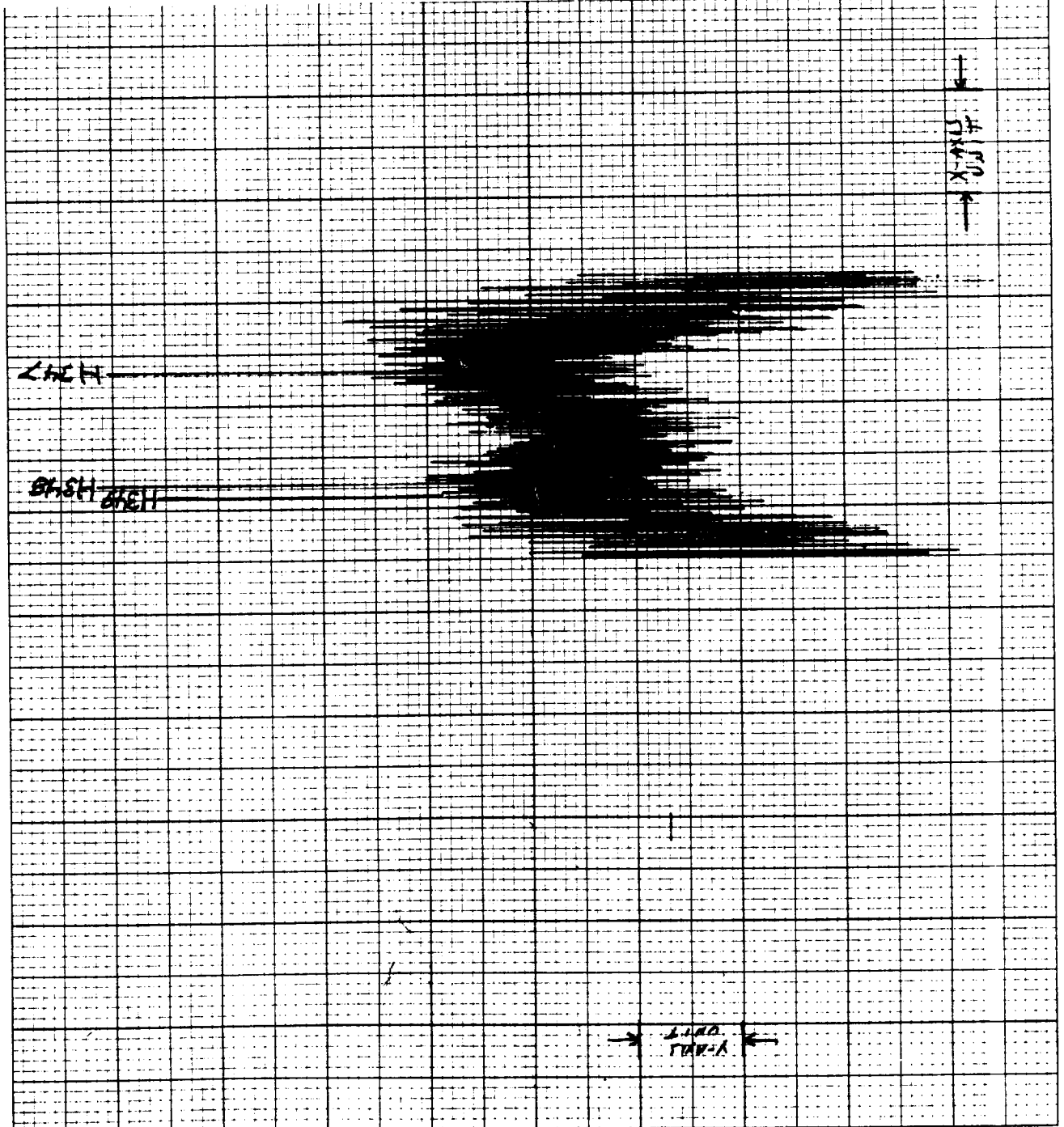
X-AXIS  
UNIT

DATE: 6/8/83 NOZZLE: T4S-11  
 TEST POINT: L.V. - 1 ; ACOUSTIC - 1139  
 PLOT IDENTIFICATION: 6-208

TRAVERSE DETAILS:  
 AXIAL ☐ : ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R  
 LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>  
 RADIAL X : E.W. - ☒ ; N.S. - ☐  
 AXIAL REF. (X-0) - 1.834 VOLTS X  
 LOCATIONS: TRAVERSE - 2.416 VOLTS D<sub>eq</sub>

SCALE : X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-347 TO H-349  
 X=0

DATE: 6/8/83 NOZZLE: T4S-11

TEST POINT: L.V. - 1 ; ACOUSTIC - 1139

PLOT IDENTIFICATION: G-209

TRAVERSE DETAILS:

AXIAL ☐ : ☐ - ☐ ; OFFSET ☐

RADIAL REF. (C) - VOLTS R =

LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐

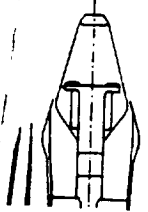
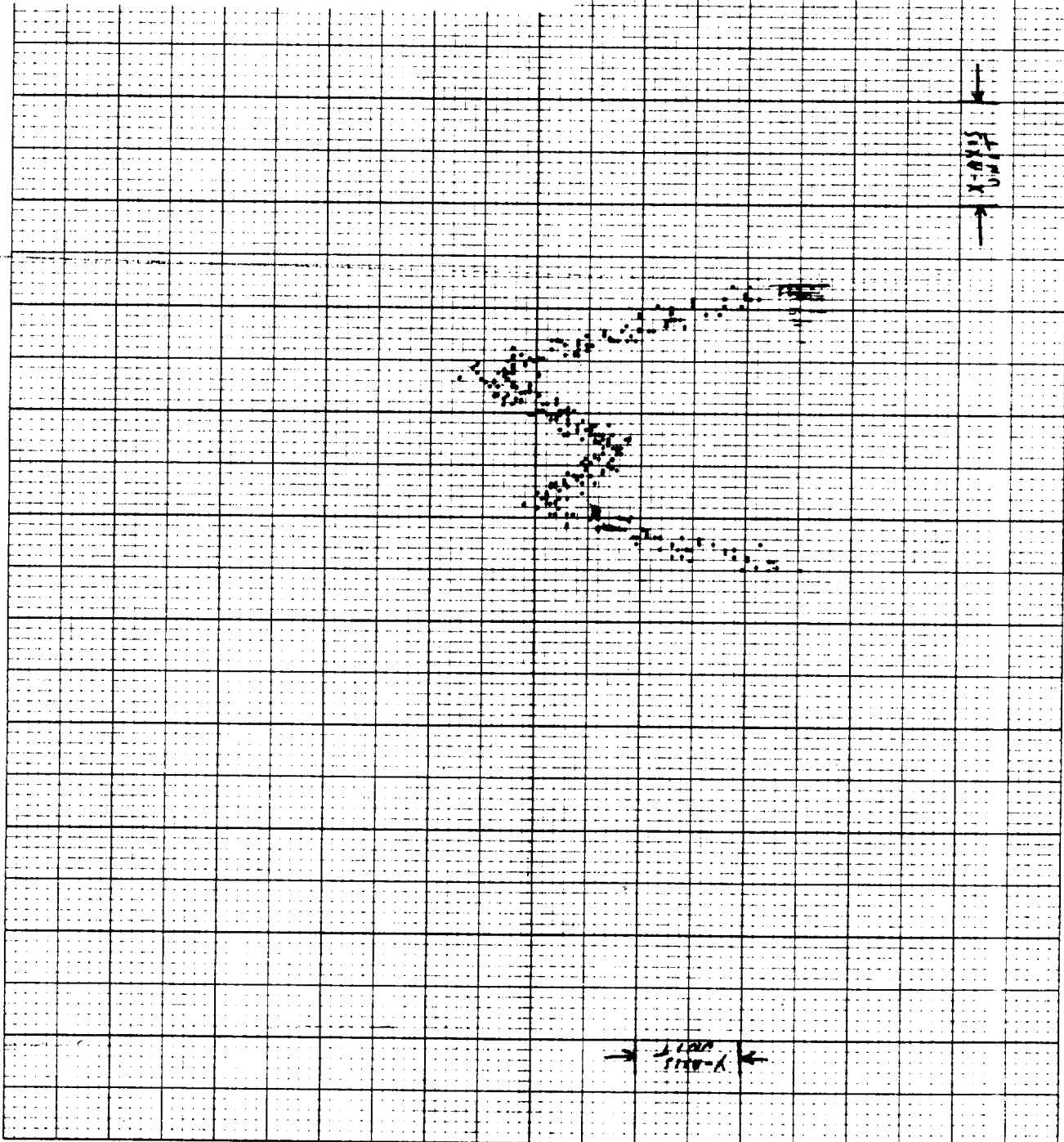
AXIAL REF. (X) - VOLTS X = 70

LOCATIONS: TRAVERSE - 2.416 VOLTS D =

SCALE : X-AXIS = 3317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

LASER VELOCIMETER TEST POINT 2

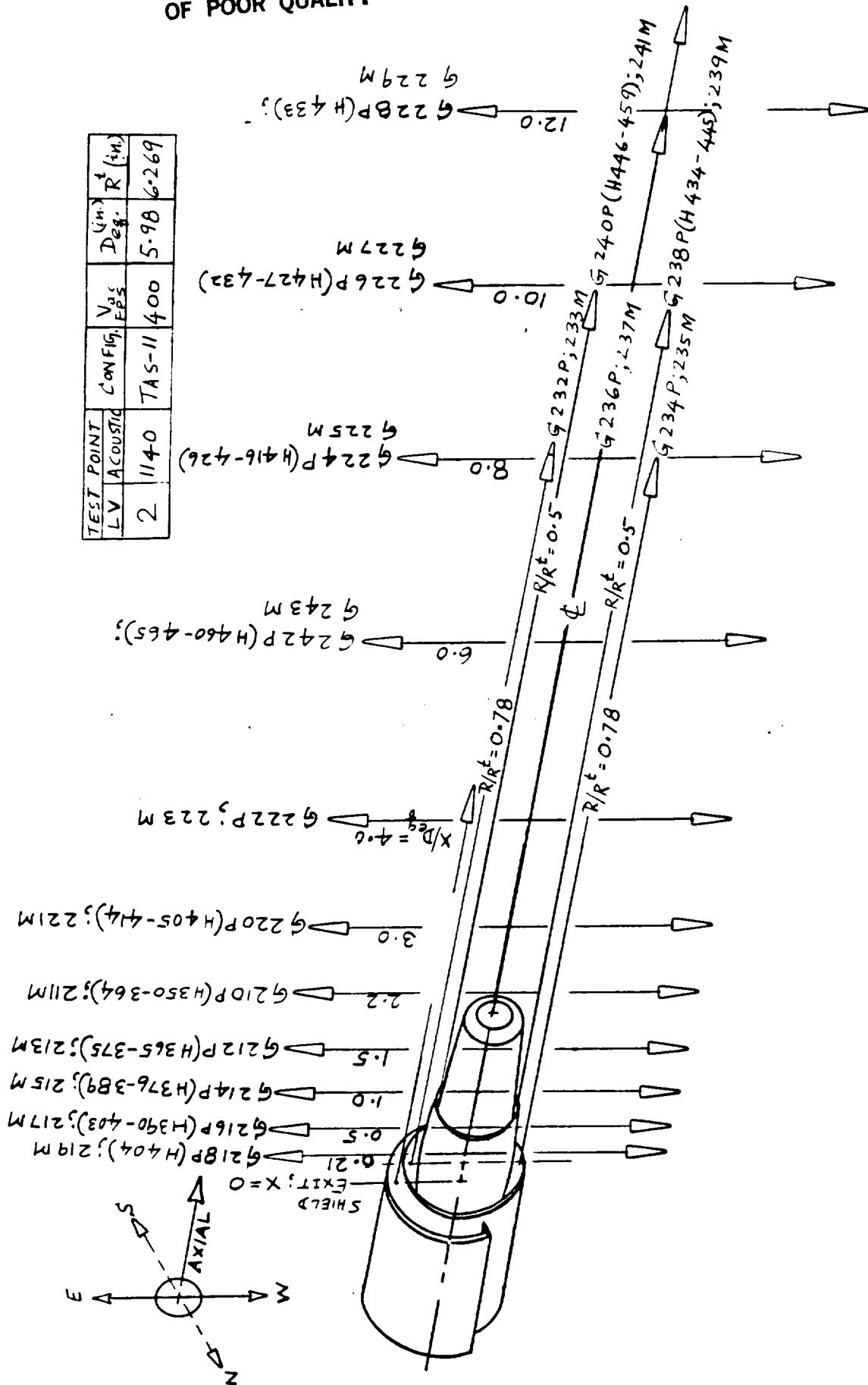
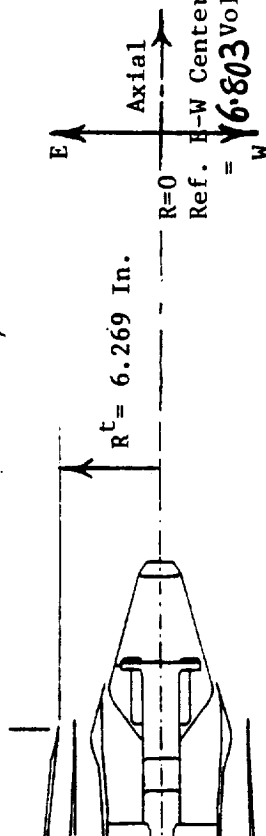


Figure 5.3 Pictorial Representation of Scope of LV Measurement on Configuration TAS-11 for LV Test Point 2. (Matching Acoustic Test Point 1140, Simulated Flight, Takeoff Condition). (Repeat).

$$D_{eq} = \sqrt{4(A^O + A^I)/\pi} = 5.98 \text{ in.}$$

X=0 (Ref. Shield Exit = 1.83); Volts


$$\begin{array}{r} \text{fps} \\ \hline 2025 \\ \hline \end{array} \quad \begin{array}{r} \text{fps} \\ \hline 2325 \\ \hline \end{array} \quad \begin{array}{r} \text{fps} \\ \hline 1540 \\ \hline \end{array} \quad \begin{array}{r} \text{fps} \\ \hline 1470 \\ \hline \end{array} \quad \begin{array}{r} \text{fps} \\ \hline 400 \\ \hline \end{array}$$

Graph Number		Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
								X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	$V'/V^{mix}$
Pen	Min1			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
210	211	E-W	-	2.017	-	13.38	-	2.24	-	-	-	-	-	-
			350		8.142		4.607		0.735	1092	190	0.539	0.094	EAST
			351		8.066		4.189		0.668	1347	144	0.665	0.071	
			352		8.066		4.189		0.668	1356	136	0.670	0.067	
			353		7.928		3.731		0.595	1499	87	0.740	0.043	
			354		7.760		3.174		0.506	2029	60	1.00	0.03	
			355		7.593		2.620		0.418	2051	14	1.013	0.007	
			356		7.426		2.066		0.330	2030	64	1.002	0.032	
			357		7.284		1.595		0.254	1772	158	0.875	0.078	
			358		7.140		1.118	Y	0.178	1364	89	0.674	0.044	Y



**Table 5-III.**  
**Laser Velocimeter Measurement Data**

**Configuration: TAS-11**

**LV Test Point:**

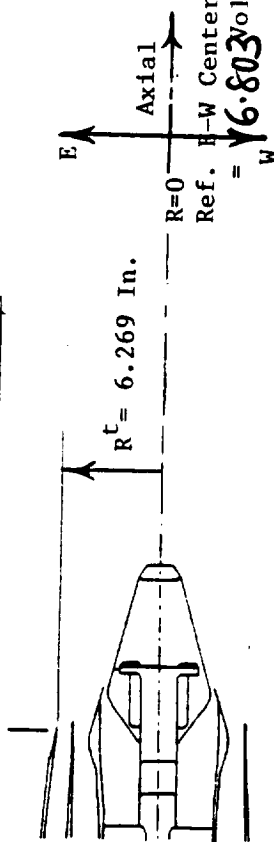
### Matching

## Acoustic

1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit = 1.83), Volts


$$v_{mix} = 2025 \text{ fps}$$
$$v^0 = 2325 \text{ fps}$$
$$v_i = 1540 \text{ fps}$$
$$v_s = 1420 \text{ fps}$$
$$V_{ac} = \frac{400}{\text{fps}}$$

Graph Number		Location (X and R)				Velocity (V and V')				Comments				
Pen	Mini	Type (Ax. - E-W)	Historian Number	Volts		Inches		Normalized			Feet/Sec.		Normalized	
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sub>t</sub>		$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$
210			359	2.017	6.399	13.38	1.539	2.24	0.245	1386	57	0.684	0.028	WEST
			360		7.889		3.602		0.575	1662	125	0.821	0.062	EAST
			361		6.187		2.043		0.326	1899	140	0.938	0.069	WEST
			362		6.004		2.650		0.423	2049	27	1.012	0.013	
			363		5.837		3.204		0.511	1681	255	0.830	0.126	
			364		5.696		3.672		0.586	1041	224	0.514	0.111	
212	213	E-W	-	1.959	-	9.209	-	1.54	-	-	-	-	-	
			365		6.118		2.272		0.362	1467	64	0.724	0.032	WEST
			366		5.982		2.723		0.434	1969	126	0.972	0.062	
			367		5.851		3.158		0.504	2051	15	1.013	0.007	

Table 5-III. Laser Velocimeter Measurement Data

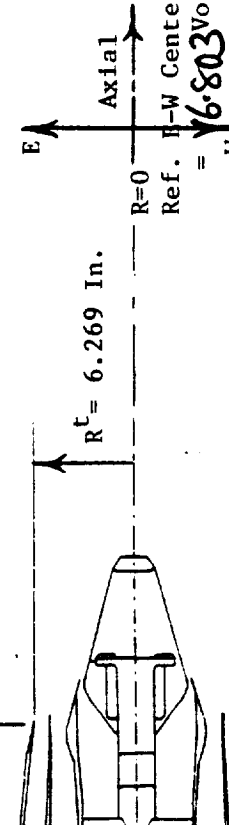
Configuration: TAS-11

LV Test Point: 2

Matching Acoustic Test Point: 1140

$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$   
= 5.98 In.

X=0 (Ref. Shield Exit = 1.831, Volts



$R^t = 6.269$  In.

$v^{mix} = 2025$  fps

$v^0 = 2325$  fps

$v^1 = 1540$  fps

$v^s = 1470$  fps

$v_{ac} = 400$  fps

Ref. H-W Center

= 6.803 Volts

Graph Number		Traverse Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	V'/V <sup>mix</sup>	
212			368	1.959	5.725	9.209	3.575	1.54	0.570	2031	71	1.003	0.035	WEST
			369		5.630		3.891		0.621	1407	279	0.695	0.138	↓
			370		8.335		5.081		0.811	1083	199	0.535	0.098	EAST
			371		8.161		4.504		0.718	1449	85	0.716	0.042	
			372		8.029		4.066		0.649	1544	102	0.763	0.050	
			373		7.853		3.483		0.556	2052		1.013	0.003	
			374		7.758		3.167		0.505	2042	37	1.011	0.018	
✓			375	✓	7.486	✓	2.265	✓	0.361	1442	68	0.712	0.034	↓
214	215	E-W	-	1.914	-	5.971	-	1.00	-	-	-	-	-	-
↓			376	↓	7.749	↓	3.138	↓	0.501	1183	76	0.584	0.038	EAST

Table 5-III. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831), Volts

Configuration: TAS-11

LV Test Point: 2

Matching

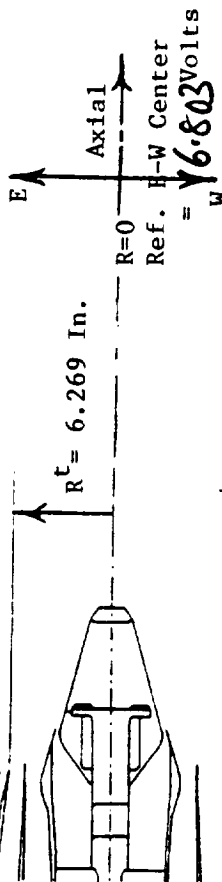
Acoustic

Test Point: 1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.98 In.

$v^{mix} =$  2025 fps  
 $v^0 =$  2325 fps  
 $v^1 =$  1540 fps  
 $v^s =$  1470 fps  
 $v_{ac} =$  400 fps



Graph Number		Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
214			377	1.914	7.848	5.971	3.466	1.00	0.553	Insufficient Samples				EAST
			378		7.934		3.751		0.598	1962	86	0.969	0.043	
			379		8.058		4.163		0.664	2000	79	0.988	0.039	
			380		8.166		4.521		0.721	1543	223	0.762	0.110	
			381		8.286		4.919		0.785	1434	79	0.708	0.039	
			382		8.351		5.134		0.819	1441	83	0.712	0.041	
			383		8.445		5.446		0.869	1315	161	0.650	0.080	✓
			384				-		-	TOOK NO DATA				-
			385		5.442		4.514		0.720	1288	318	0.636	0.157	WEST
			386		5.546		4.169	✓	0.665	1975	153	0.475	0.076	↓

Table 5-III. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831), Volts

Configuration: TAS-11

LV Test Point: 2

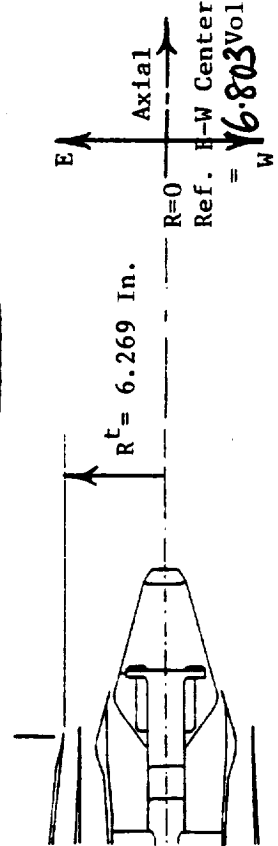
Matching

Acoustic

Test Point: 1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

$v^{mix} = 2025$  fps  
 $v^0 = 2325$  fps  
 $v^1 = 1540$  fps  
 $v^s = 1470$  fps  
 $v_{ac} = 400$  fps



Graph Number		Type (Ax. - R-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini	Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$			
214		387	1.914	5.621	5.971	3.920	1.00	0.625	2051	6	1.013	0.003	WEST	
		388		5.675		3.741		0.597	2052	1	1.013	0.001		
		389		5.772		3.420		0.545	2049	16	1.012	0.008	Y	
216	217	-	1.873	-	3.022	-	0.50	-	-	-	-	-	-	
		390		5.292		5.012		0.800	1948	213	0.962	0.105	WEST	
		391		5.363		4.776		0.762	2035	68	1.005	0.034		
		392		5.460		4.454		0.711	2048	33	1.011	0.016		
		393		5.507		4.299		0.686	2053	31	1.014	0.015	Y	
		394		8.641		6.096		0.972	1246	210	0.615	0.104	EAST	
		395		8.641		6.096		0.972	1244	209	0.614	0.103	Y	

Table 5-III. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831), Volts

Configuration: TAS-11

LV Test Point: 2

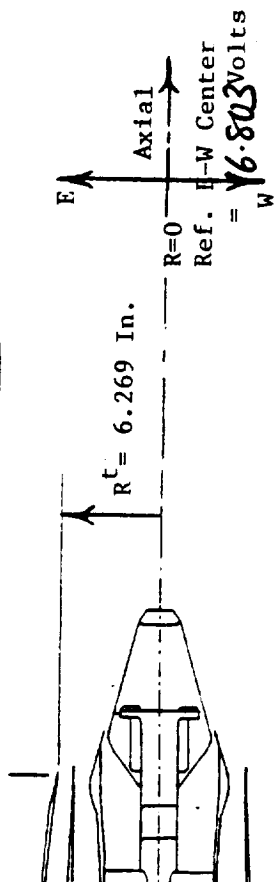
Matching

Acoustic

Test Point: 1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

$V^{mix} = \underline{2025}$  fps  
 $V^0 = \underline{2325}$  fps  
 $V^1 = \underline{1540}$  fps  
 $V^S = \underline{1470}$  fps  
 $V_{ac} = \underline{400}$  fps



Graph Number		Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
Pen	Mini			Volts		Inches		Normalized		Feet/Sec.			Normalized	
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	$V'/V^{mix}$
216			396	1.873	8.550	3.022	5.794	0.50	0.924	1568	81	0.774	0.04	EAST
			397		8.471		5.532		0.882			0.793	0.05	
			398		8.392		5.270		0.841			0.838	0.046	
			399		8.350		5.131		0.818			0.996	0.052	
			400		8.289		4.929		0.786	2045	43	1.010	0.021	
			401		8.253		4.809		0.767	2046	45	1.010	0.022	
			402		8.141		4.438		0.708	2073	66	1.024	0.033	
			403		8.078		4.229		0.675	2107	81	1.040	0.04	↓
218	219	E-W	-	1.848	-	1.223	-	0.21	-	-	-	-	-	-
			404		5.336		4.866		0.776	1900	207	0.938	0.102	WEST

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

Diagram illustrating the reference point for the vehicle chassis. The reference point is labeled  $R=0$  and is located at the front center of the vehicle. The distance from the reference point to the left is labeled  $R^t = 6.269$  In. The distance from the reference point to the right is labeled  $R=0$  and  $16.803$  Volts.

$$\begin{array}{rcl} v_{m1x} & = & \underline{2025} \text{ fps} \\ v_0 & = & \underline{2325} \text{ fps} \\ v_1 & = & \underline{1540} \text{ fps} \\ v_8 & = & \underline{1470} \text{ fps} \\ v_{ac} & = & \underline{400} \text{ fps} \end{array}$$

Graph Number		Histogram Number	Location (X and R)						Velocity (V and V')				Comments	
Pen	MIn1		Traverse Type (Ax. - E-W)	Volts		Inches		Normalized		Feet/Sec.		Normalized		
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'	V̄/V <sup>mix</sup>		V'/V <sup>mix</sup>
220	221	-	2.084	-	18.20	-	3.04	-	-	-	-	-	-	-
		405		8.176		4.554			0.726	996	179	0.492	0.088	EAST
		406		7.944		3.784			0.604	1373	129	0.678	0.064	
		407		7.732		3.081			0.492	1881	147	0.929	0.073	
		408		7.550		2.478			0.395	2049	19	1.012	0.009	
		409		7.288		1.609			0.257	1979	103	0.977	0.051	
		410		7.078		0.912			0.145	1669	174	0.824	0.086	↓
		411		6.782		0.070			0.011	1289	114	0.637	0.056	WEST
		412		6.338		1.542			0.246	1868	123	0.923	0.061	↓
		413		6.110	↓	2.299	↓	↓	0.367	2046	27	1.010	0.013	↓

Table 5-III. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831), Volts

Configuration: TAS-11

I.V Test Point: 2

Matching

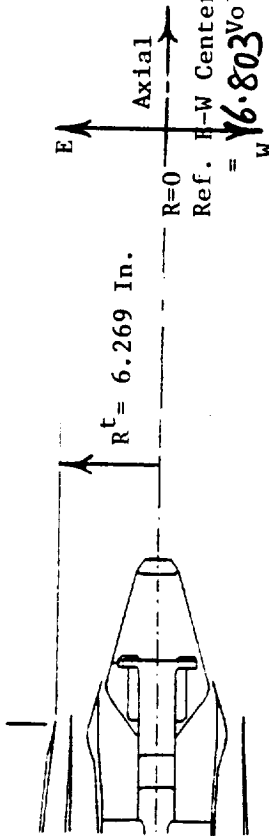
Acoustic

Test Point: 1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.98 In.

$V^{mix} =$  2025 fps  
 $V^0 =$  2325 fps  
 $V^1 =$  1540 fps  
 $V^S =$  1420 fps  
 $V_{ac} =$  400 fps



Graph Number		Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
220			414	2.084	5.893	18.20	3.018	3.04	0.481	1753	234	0.866	0.116	WEST
222	223	E-W	-	2.167	-	24.17	-	4.04	-	-	-	-	-	-
224	225	E-W	-	2.499	-	48.06	-	8.04	-	-	-	-	-	-
			416		5.523		4.245		0.677	1122	254	0.554	0.125	WEST
			417		5.805		3.310		0.528	1477	260	0.729	0.128	
			418		6.079		2.401		0.383	1751	205	0.865	0.101	
			419		6.412		1.297		0.207	1769	153	0.874	0.076	
			420		6.672		0.434		0.069	1646	125	0.813	0.062	
			421		6.672		0.434		0.069	1662	140	0.821	0.069	Y
Y			422		7.124	Y	1.065	Y	0.170	1841	166	0.909	0.082	EAST

Table 5-III. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.83), Volts

Configuration: TAS-11

LV Test Point: 2

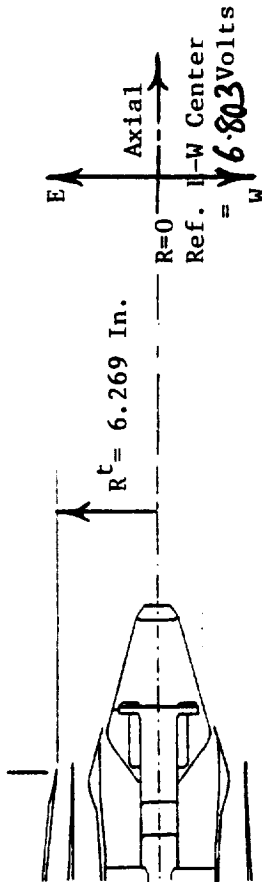
Matching

Acoustic

Test Point: 1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

$V^{mix} = 2025$  fps  
 $V^0 = 2325$  fps  
 $V^1 = 1540$  fps  
 $V^s = 1470$  fps  
 $V_{ac} = 400$  fps



Graph Number	Pen	Mini	Traverse Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
					Volts		Inches		Normalized		Feet/Sec.			Normalized	
					Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	V'/V <sup>mix</sup>
224				423	2.499	7.443	48.06	2.123	8.04	0.339	1918	160	0.947	0.079	EAST
				424		7.746		3.128		0.500	1722	267	0.850	0.132	
				425		7.990		3.937		0.628	1318	289	0.651	0.143	
	✓			426	✓	8.267	✓	4.856	✓	0.775	1000	235	0.494	0.116	✓
226		227	E-W	-	2.665	-	60.00	-	10.03	-	-	-	-	-	-
				427		5.691		3.688		0.588	1338	260	0.661	0.128	WEST
				428		6.153		2.136		0.341	1684	189	0.832	0.093	
				429		6.717		0.285		0.046	1702	180	0.840	0.089	
				430		6.153		2.136		0.341	1727	144	0.853	0.071	✓
	✓			431	✓	7.282	✓	1.589	✓	0.253	1793	183	0.885	0.090	EAST



Table 5-III. Laser Velocimeter Measurement Data

Configuration: TAS-11

LV Test Point: 2

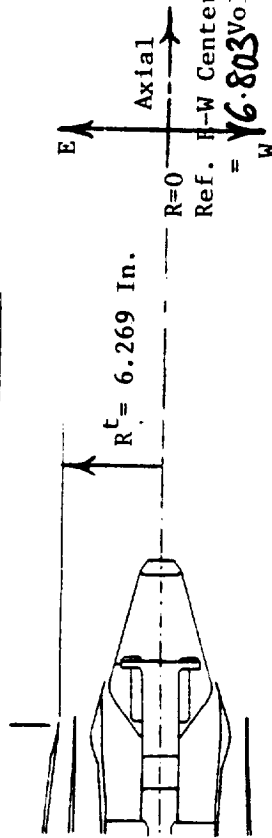
Matching

Acoustic

Test Point: 1140

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit = 1.831, Volts



$V_{mix} = 2025$  fps  
 $V^0 = 2325$  fps  
 $V^1 = 1540$  fps  
 $V^S = 1470$  fps  
 $V_{ac} = 400$  fps

Ref. H-W Center  
 $= 16.803$  Volts

Graph Number		Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
													$\bar{V}/V^{mix}$	$V'/V^{mix}$
Pen	Mini	Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$			
226		2.665	7.815	60.00	3.357	10.03	0.535	1431	284	0.707	0.140	EAST		
228	229	2.831		71.94		12.03								
↓		↓	6.889	↓	0.285	↓	0.046	1719	185	0.849	0.091	EAST		
232	233		8.280		4.840		0.781					EAST		
234	235		5.333		4.876		0.778					WEST		
236	237		6.803		0.0		0.0					NOZZLE AXIS		
238	239		5.870		3.095		0.494					WEST		
↓		2.831		71.94		12.03		1488	230	0.735	0.114			
↓		2.499		48.06		8.04		1583	265	0.782	0.131			
↓		2.665	↓	60.00	↓	10.03	↓	1547	238	0.764	0.118	↓		

$$D_{eq} = \sqrt{4(A^0 + A^i)/\pi} = 5.98 \text{ in.}$$

$v_{\text{mix}} =$	<u>2025</u>	fps
$v_0 =$	<u>2325</u>	fps
$v_1 =$	<u>1540</u>	fps
$v_8 =$	<u>1470</u>	fps
$v_{ac} =$	<u>400</u>	fps

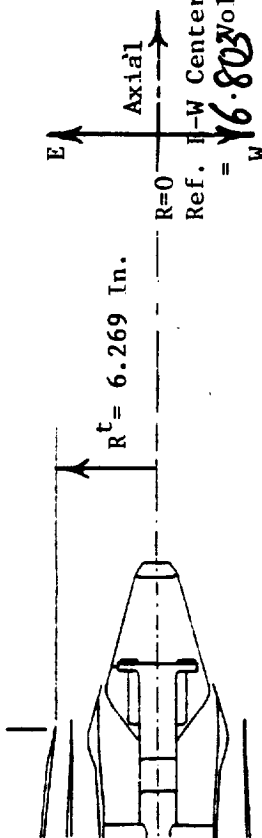
[illegible]

Table 5-III. Laser Velocimeter Measurement Data

Configuration: TAS-11

LV Test Point: 2

Matching Acoustic Test Point: 1140

$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$   
= 5.98 In.

X=0 (Ref. Shield Exit = 1.83); Volts

$R^t = 6.269$  In.

Ref. H-W Center = 16.803 Volts

$v^{mix} = \underline{2025}$  fps

$v^0 = \underline{2325}$  fps

$v^1 = \underline{1540}$  fps

$v^8 = \underline{1470}$  fps

$v_{ac} = \underline{400}$  fps

Graph Number		Pen	Mini	Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
						Volts		Inches		Normalized		Feet/Sec.			Normalized	
						Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
240	241			AXIAL	-	-	7.750	-	3.141	-	0.501	-	-	-	-	EAST
					446	2.831		71.94		12.03		1350	265	0.667	0.131	
					447	2.665		60.00		10.03		1509	280	0.745	0.138	
					448	2.416		42.09		7.04		1829	272	0.903	0.134	
					449	2.499		48.06		8.04		1681	291	0.830	0.144	
					450	2.332		36.04		6.03		1948	262	0.962	0.129	
					451	2.332		36.04		6.03		1935	250	0.956	0.123	
					452	2.249		30.07		5.03		1933	230	0.955	0.114	
					453	2.166		24.10		4.03		1931	185	0.954	0.091	
					454	2.125		21.15		3.54		1945	173	0.960	0.085	Y

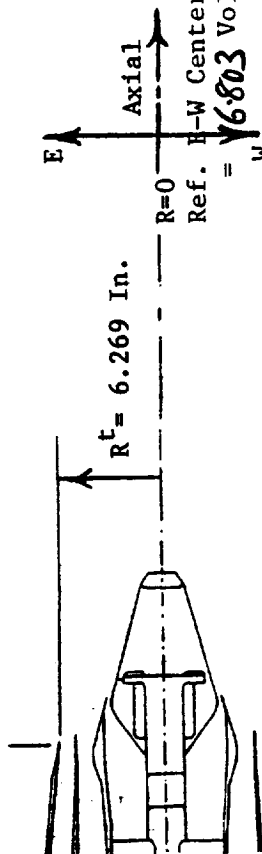
$$D_{eq} = \sqrt{4(A^0 + A^i)/\pi} = 5.98 \text{ In.}$$
$$\begin{array}{rcl} v_{\text{mix}} & = & \underline{2025} \text{ fps} \\ v^0 & = & \underline{2325} \text{ fps} \\ v^1 & = & \underline{1540} \text{ fps} \\ v^s & = & \underline{1470} \text{ fps} \\ v_{\text{ac}} & = & \underline{400} \text{ fps} \end{array}$$
[illegible]

Table 5-III. Laser Velocimeter Measurement Data

Configuration: TAS-11

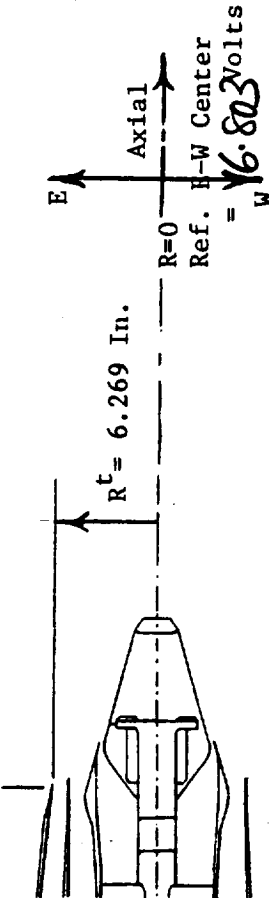
LV Test Point:

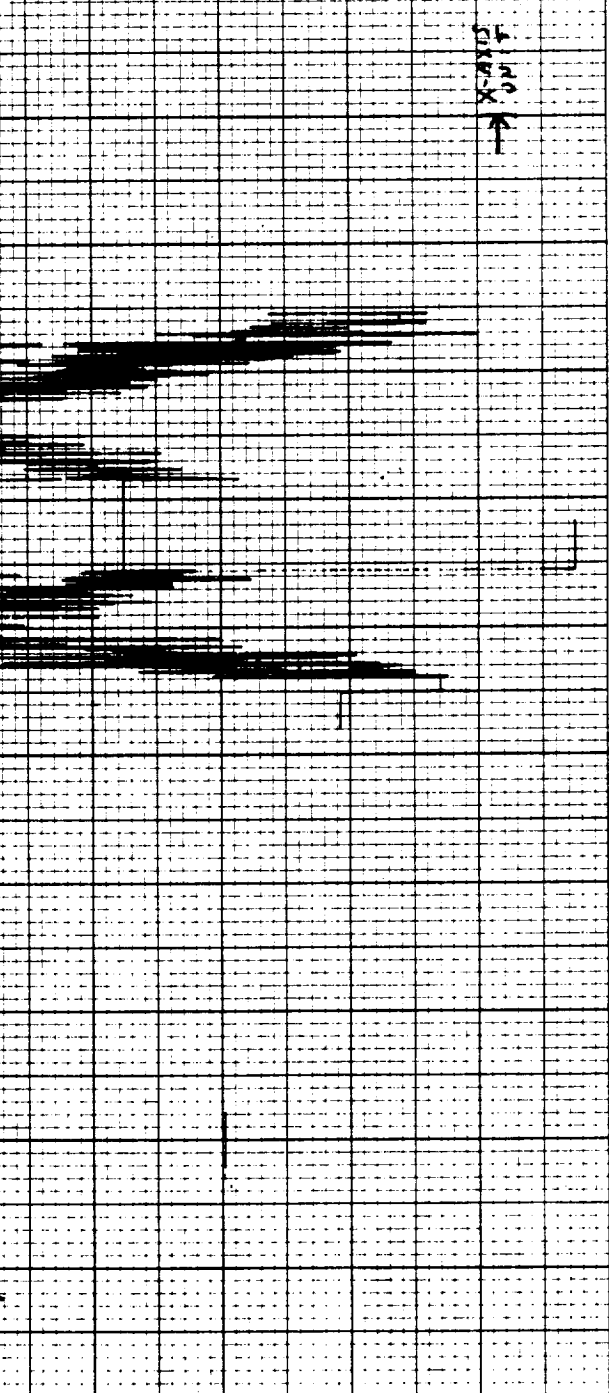
## Matching

## Acoustic

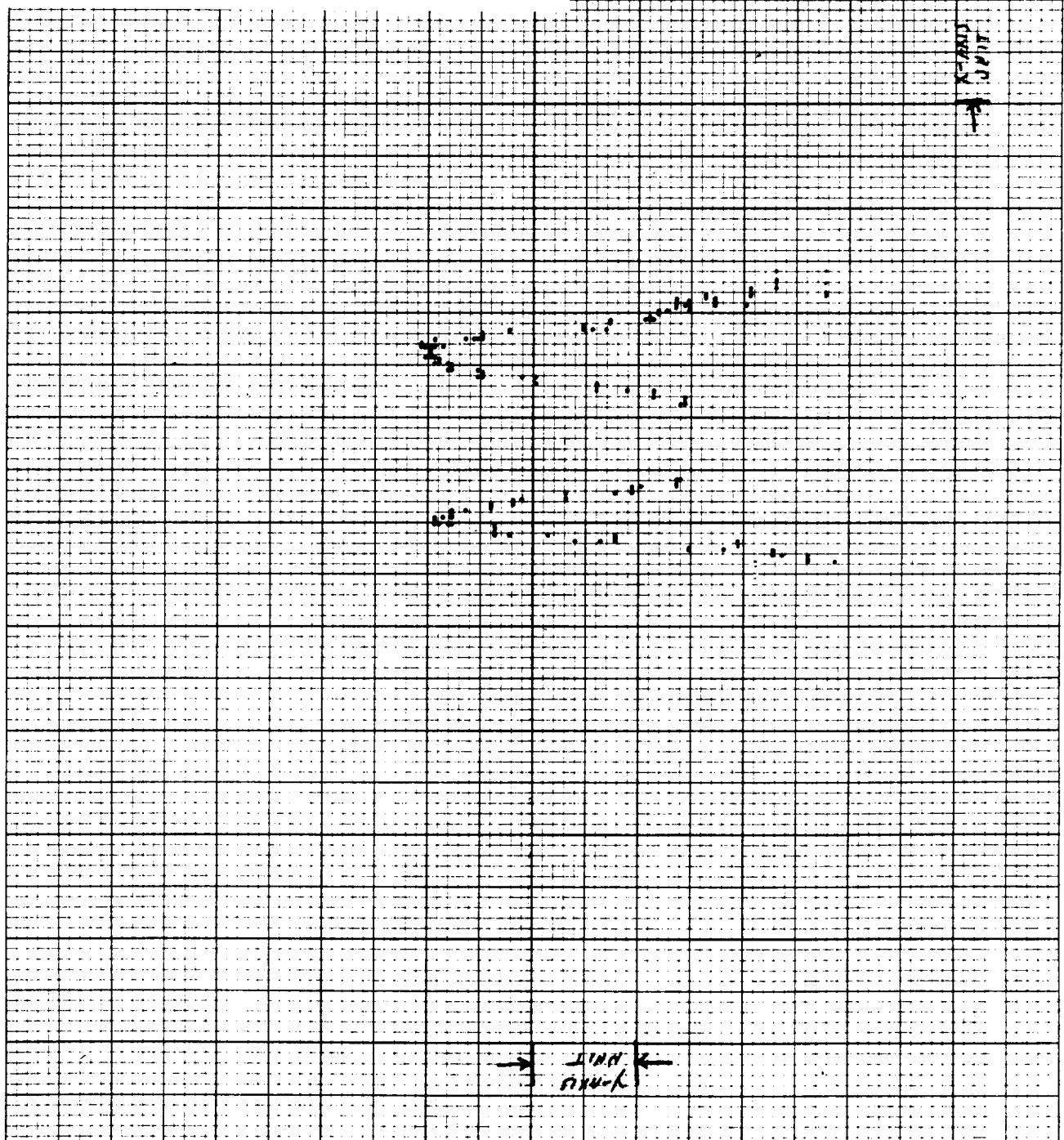
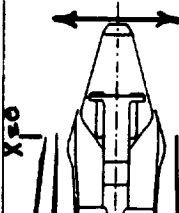
$$D_{eq} = \sqrt{4(A^0 + A^i)/\pi} = 5.98 \text{ In.}$$

X=0 (Ref. Shield Exit = 1.83), Volts


$$\begin{array}{rcl} v^{mix} & = & 2025 \text{ fps} \\ v^0 & = & 2325 \text{ fps} \\ v^I & = & 1540 \text{ fps} \\ v^S & = & 1470 \text{ fps} \\ v_{ac} & = & 400 \text{ fps} \end{array}$$
[illegible]

[illegible]

DATE: 6/8/83	NOZZLE: THS-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 1140	
PLOT IDENTIFICATION: 6-211	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : $\downarrow$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE -	VOLTS $R_2$
RADIAL $\Delta$ : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. $\Delta$ - 1.831 VOLTS $X$ = 2.2	
LOCATIONS: TRAVERSE - 2.017 VOLTS $D_{eq}$	
SCALE : X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 E.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: **6/8/63** NOZZLE: **TAs-11**

TEST POINT: **L.V. - 2** ; ACOUSTIC - **1140**

PLOT IDENTIFICATION: **G - 212**

TRAVERSE DETAILS.

AXIAL ☐ : ☒ - ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $\frac{R}{D}$

LOCATIONS: TRAVERSE VOLTS  $\frac{R}{D}$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. **0.01631** VOLTS  $\frac{R}{D}$  **15**

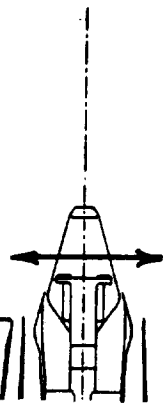
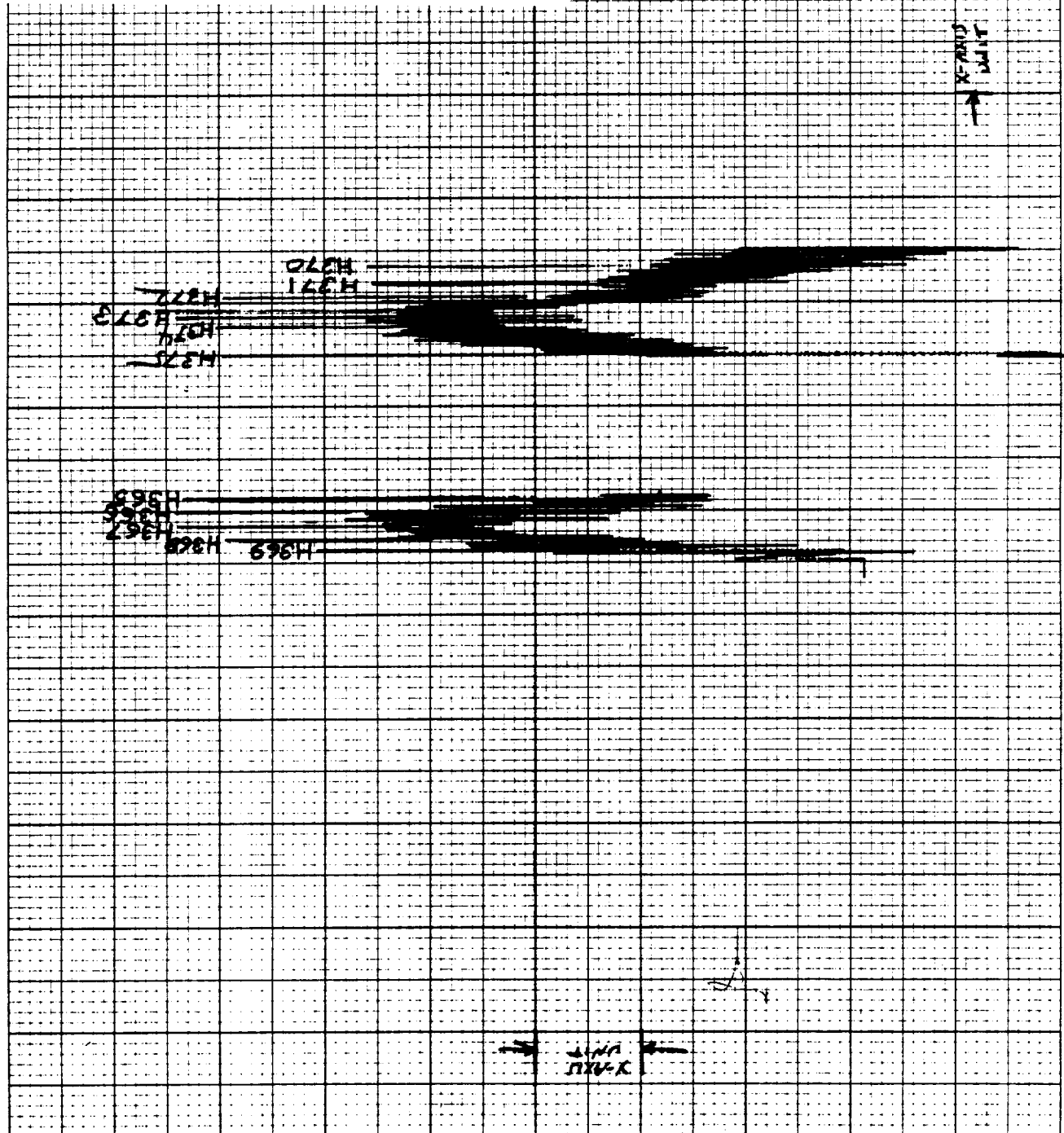
LOCATIONS: TRAVERSE **1.959** VOLTS  $\frac{R}{D}$  **eq**

SCALE : X-AXIS = **3.317** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

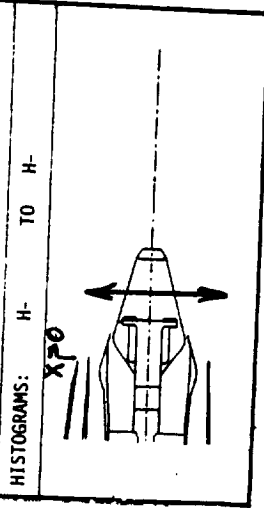
HISTOGRAMS: H-**365** TO H-**375**

**X=0**



DATE: 6/8/83 NOZZLE: TAs-11  
 TEST POINT: L.V. - 2 : ACOUSTIC - 1140  
 PLOT IDENTIFICATION: G - 213  
 TRAVERSE DETAILS:  
 AXIAL ☐ : ☐ : OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R  
 LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>  
 RADIAL X : E.W. - ☒ : N.S. - ☐  
 AXIAL REF. (C) - 1831 VOLTS X  
 LOCATIONS: TRAVERSE - 1959 VOLTS D<sub>eq</sub> = 1.5  
 SCALE: X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT



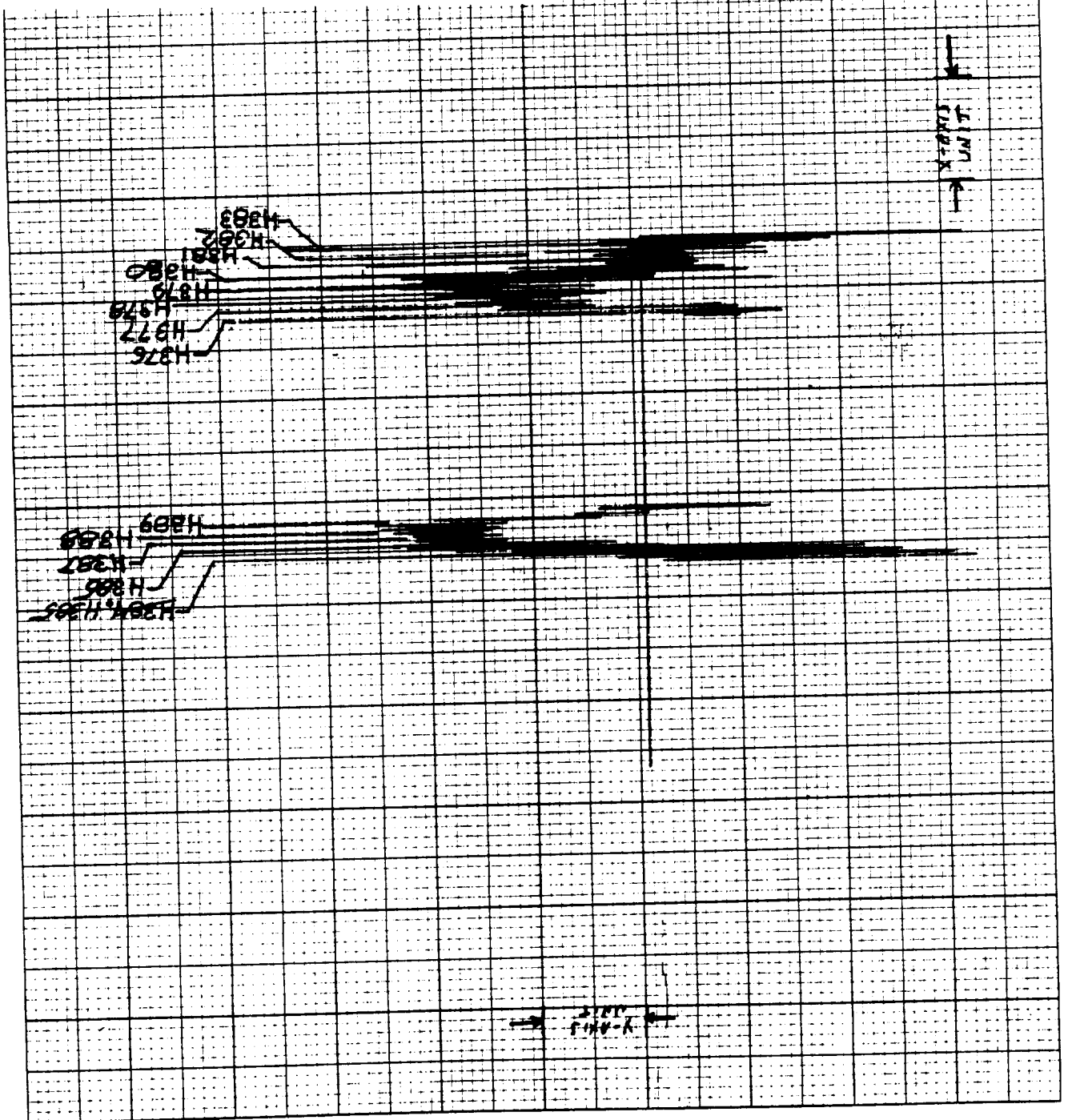
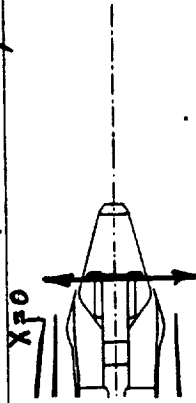
ORIGINAL PAGE IS  
 OF POOR QUALITY

1.00  
 1.00  
 1.00

1.00  
 1.00  
 1.00

C-2

DATE: 6/8/83	NOZZLE: TAs-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 114-0	
PLOT IDENTIFICATION: G-214	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL <input type="checkbox"/> : REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE - VOLTS $R_2$	RADIAL $\times$ : E.W. - 19 ; N.S. - <input type="checkbox"/>
AXIAL, REF. X-0-1-831 VOLTS $X = 1.0$	LOCATIONS: TRAVERSE - 1-914 VOLTS $D = 1.0$
SCALE : X-AXIS = 3.517 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H-376 TO H-389	



DATE: 6/8/83 NOZZLE: TAs-11

TEST POINT: L.V. - 2 ; ACOUSTIC - 1140

PLOT IDENTIFICATION: G-215

TRAVERSE DETAILS.

AXIAL ☐ : ☐ - ☐ ; OFFSET - ☐

RADIAL: REF. (C) - VOLTS  $\frac{R}{R_2}$

LOCATIONS: TRAVERSE - VOLTS  $\frac{R}{R_2}$

RADIAL ☒ : E.M. - ☒ ; N.S. - ☐

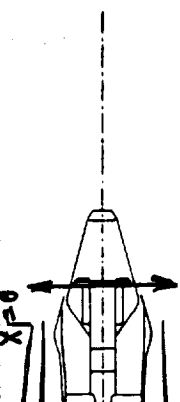
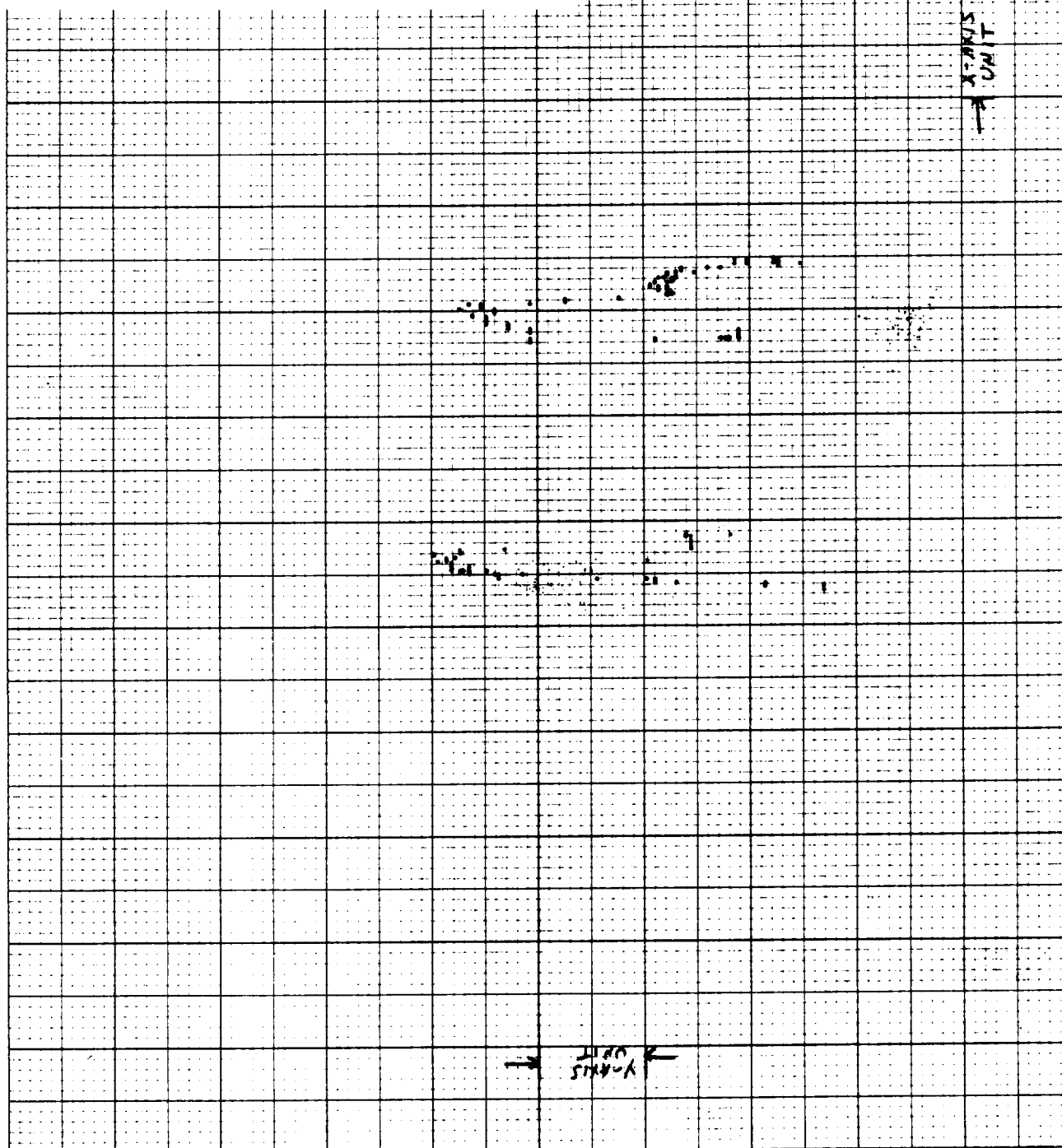
AXIAL: REF. (X) - VOLTS  $\frac{X}{X_D}$

LOCATIONS: TRAVERSE - 1.914 VOLTS  $\frac{X}{X_D}$  eq

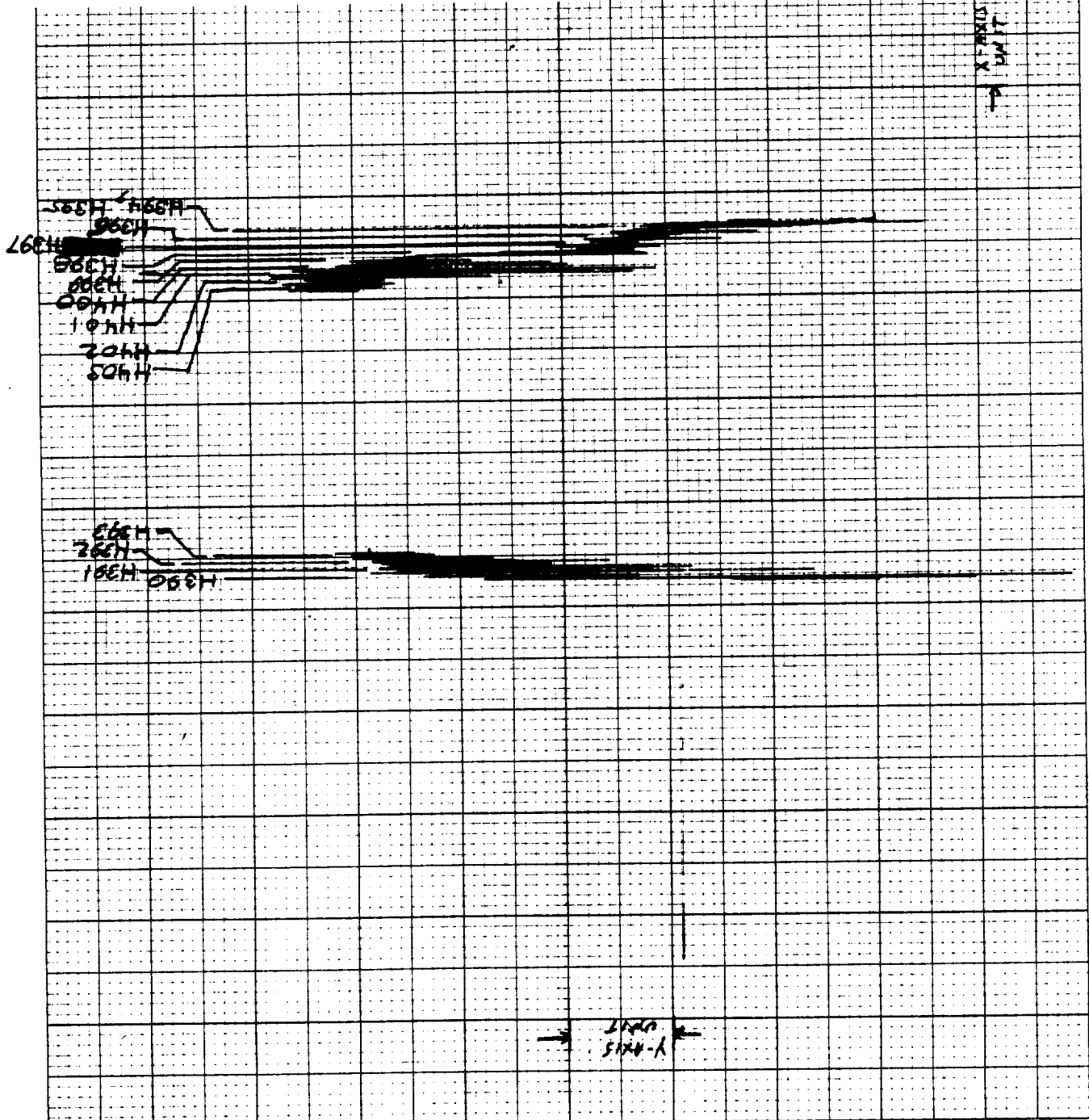
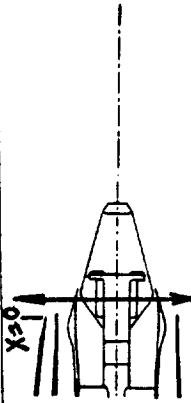
SCALE: X-AXIS=3.317 INCH/UNIT

Y-AXIS=390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

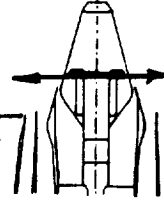



DATE: 6/8/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 1140	
PLOT IDENTIFICATION: G-216	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> ; REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE -	RADIAL <input checked="" type="checkbox"/> : E.W. - 50 ; N.S. - <input type="checkbox"/>
AXIAL LOCATIONS: TRAVERSE - 1.873 VOLTS $X_{eq}$	AXIAL LOCATIONS: TRAVERSE - 1.873 VOLTS $X_{eq}$
SCALE: X-AXIS-3.317 INCH/UNIT	Y-AXIS-390 F.P.S./UNIT
HISTOGRAMS: H-390 TO H-403	



DATE: 6/8/83	NOZZLE: TAs-11
TEST POINT: L.V. - 2	ACOUSTIC - 1140
PLOT IDENTIFICATION: G-217	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL <input type="checkbox"/> : <input type="checkbox"/> ; VOLTS $R_1$ =
LOCATIONS: TRAVERSE	LOCATIONS: TRAVERSE $R_2$ =
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	AXIAL: REF. (X-0) - 1.83 VOLTS $X = 50$
LOCATIONS: TRAVERSE - 1.873 VOLTS $D = 50$	
SCALE: X-AXIS: 3.317	INCH/UNIT
Y-AXIS: 390	F.P.S./UNIT
HISTOGRAMS: H- TO H-	

X=0



X-AXIS  
UNIT

DATE: 6/8/83 NOZZLE: TAS-11

TEST POINT: L.V. - 2 : ACOUSTIC - 140

PLOT IDENTIFICATION: G - 218

TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - 10 ; N.S. - ☐

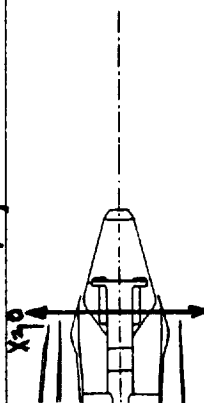
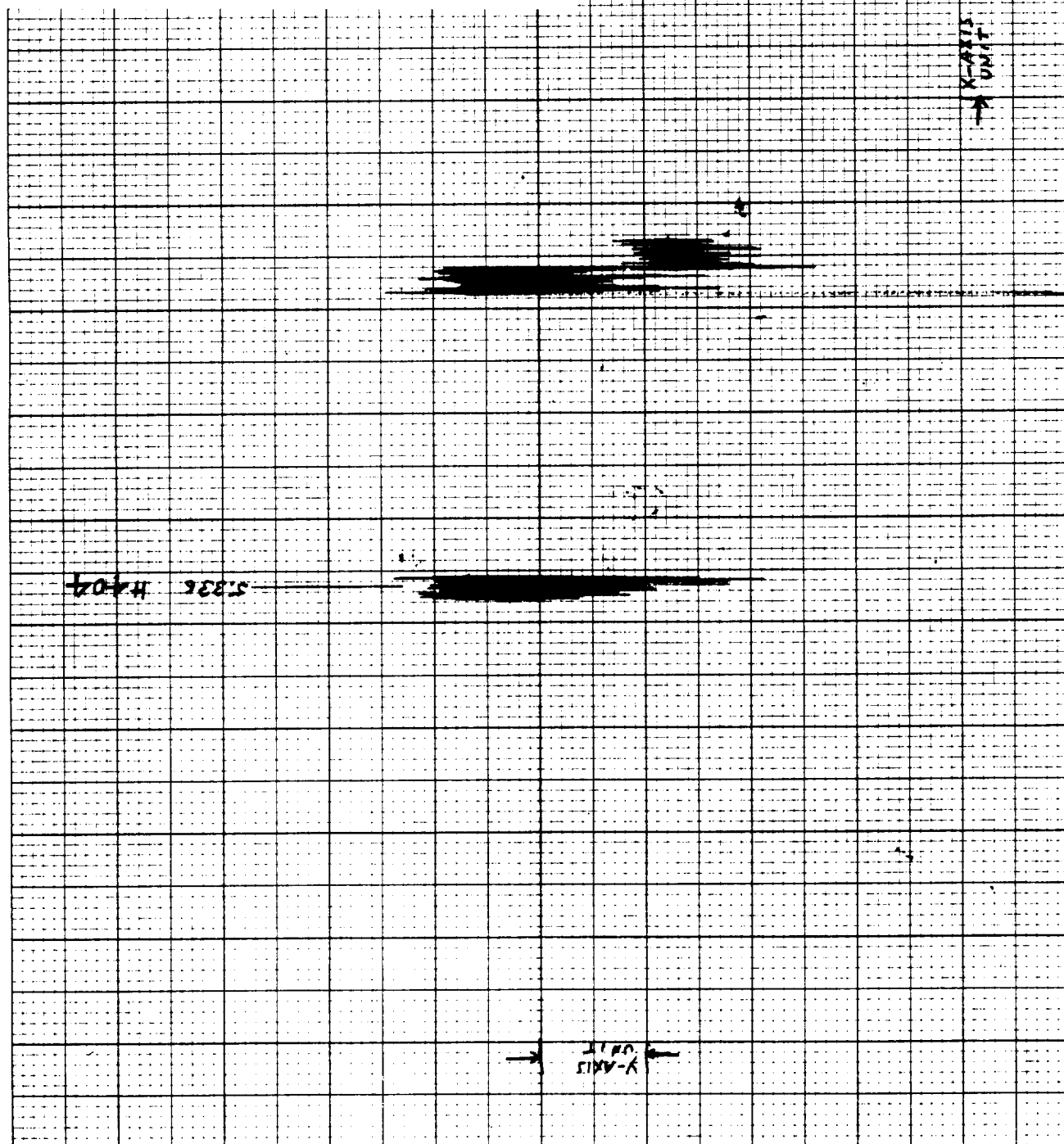
AXIAL REF. (X-0) - 1.83 VOLTS  $X_{eq}$

LOCATIONS: TRAVERSE - 1.84 VOLTS  $D$

SCALE: X-AXIS: 3.317 INCH/UNIT

Y-AXIS: 390 F.P.S./UNIT

HISTOGRAMS: H- 404 TO H- —

DATE: **6/8/83** NOZZLE: **TAS-11**

TEST POINT: **L.V. - 2** ; ACOUSTIC - **1140**

PLOT IDENTIFICATION: **G - 219**

TRAVERSE DETAILS.

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R =

LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>

RADIAL X : E.W. - **10** ; N.S. - ☐

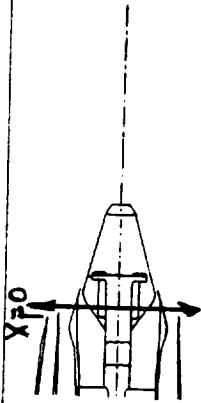
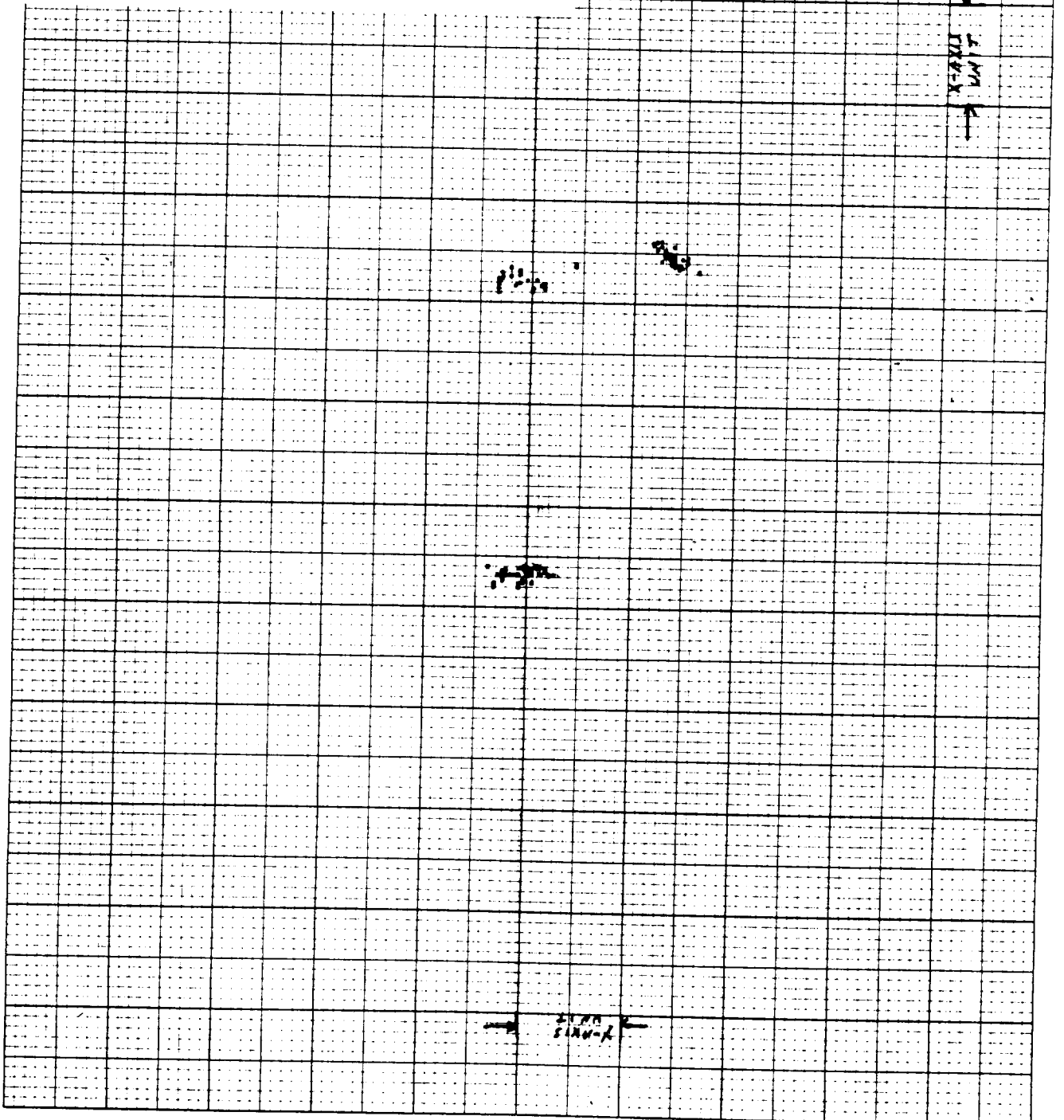
AXIAL REF. **(1.83)** VOLTS X = **21**

LOCATIONS: TRAVERSE **(1.84)** VOLTS **0** eq

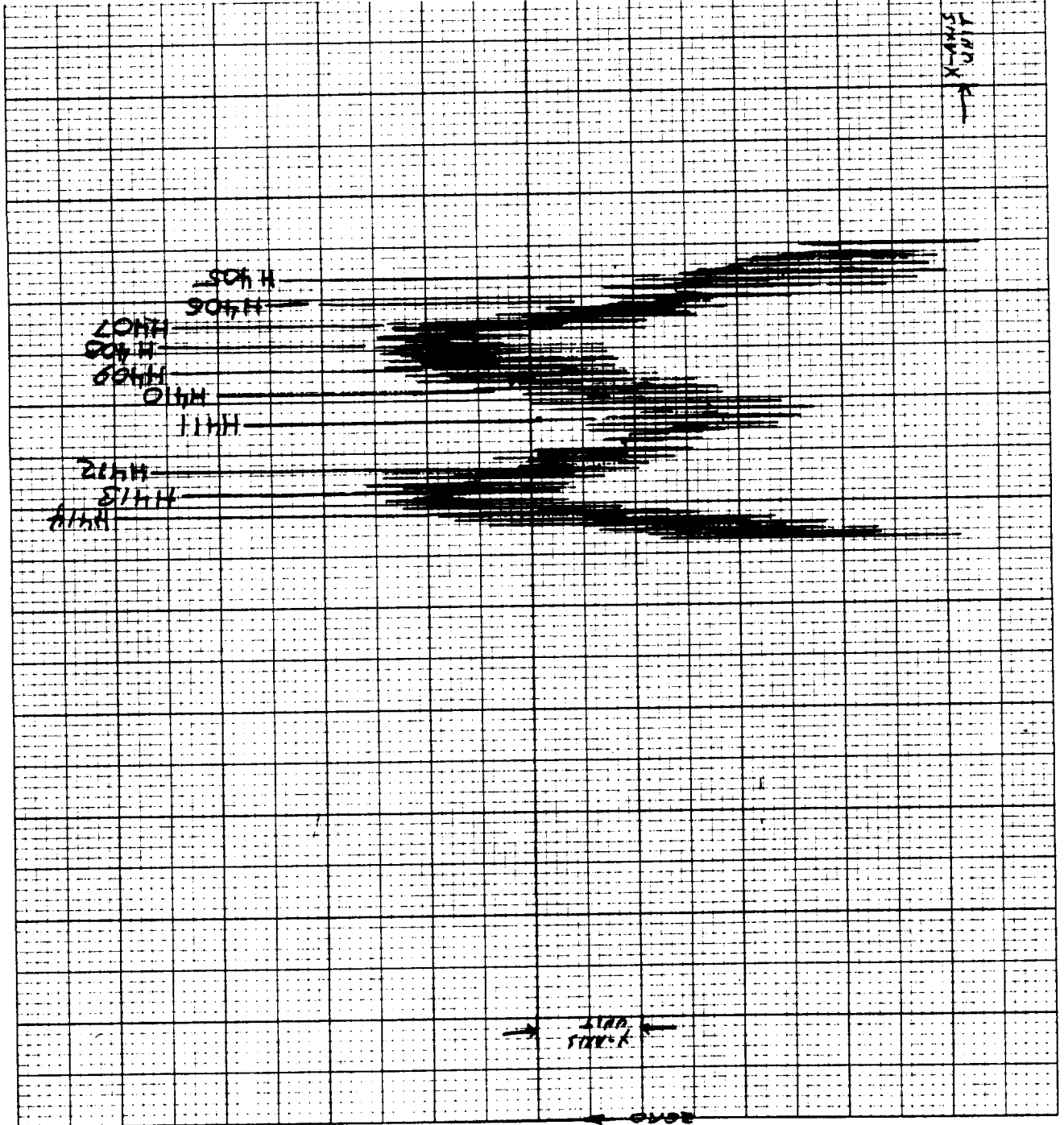
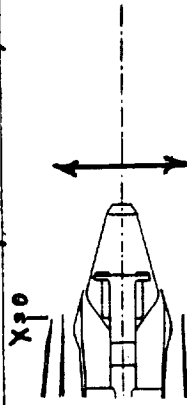
SCALE : X-AXIS = **3.317** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

HISTOGRAMS: H- TO H-

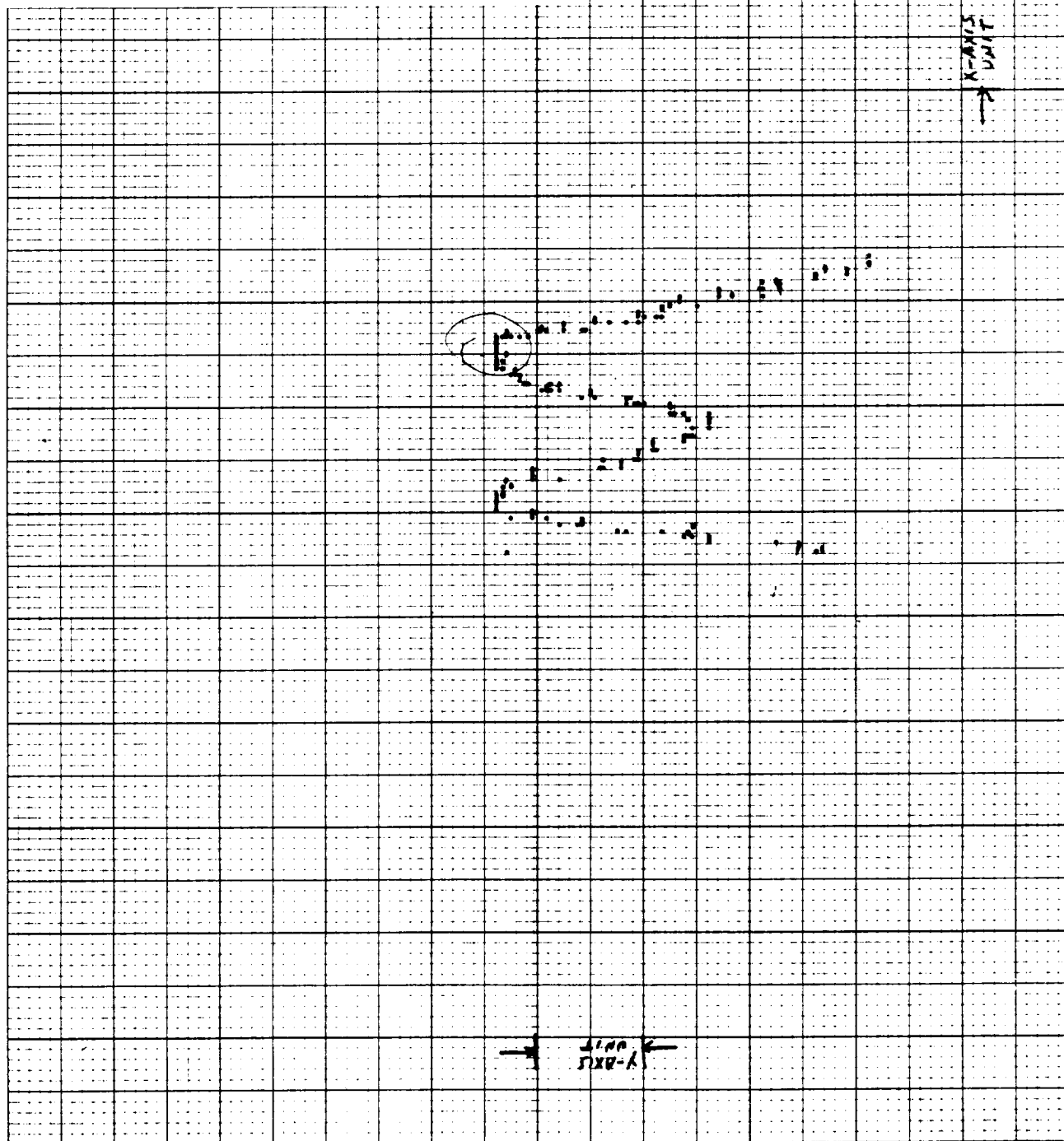
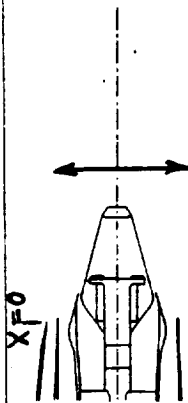



DATE: 6/8/83	NOZZLE: TAS-1
TEST POINT: L.V. - 2	ACOUSTIC - 140
PLOT IDENTIFICATION: G-220	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> : <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS R =
LOCATIONS: TRAVERSE -	VOLTS R <sub>2</sub>
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF (X-0.183) VOLTS X = 30	
LOCATIONS: TRAVERSE - 2.084	VOLTS D <sub>eq</sub>
SCALE: X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H-405 TO H-414	

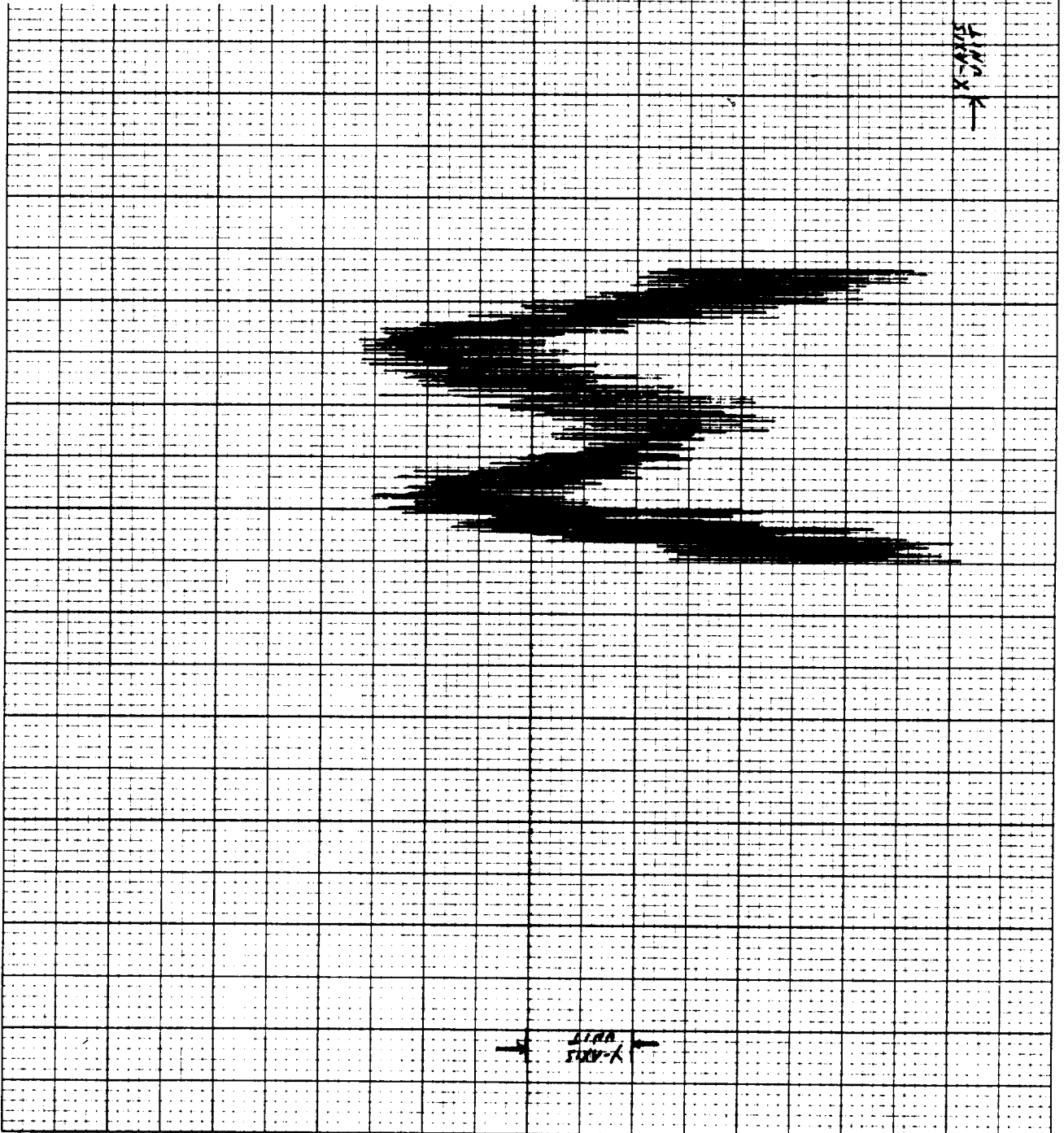
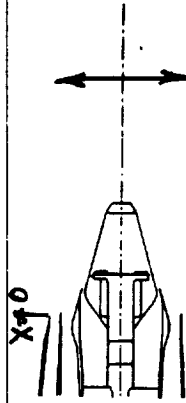




DATE: 6/8/83	NOZZLE: T4S-11
TEST POINT: L.V. - 2	ACOUSTIC - 1140
PLOT IDENTIFICATION: G-221	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	
RADIAL REF. (C) -	VOLTS R -
LOCATIONS: TRAVERSE -	VOLTS R <sub>2</sub> -
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. (X) - 183/	VOLTS X - 3.0
LOCATIONS: TRAVERSE - 2.08	VOLTS D <sub>eq</sub> -
SCALE: X-AXIS = 3.317	INCH/UNIT
Y-AXIS = 390	F.P.S./UNIT
HISTOGRAMS: H- TO H-	

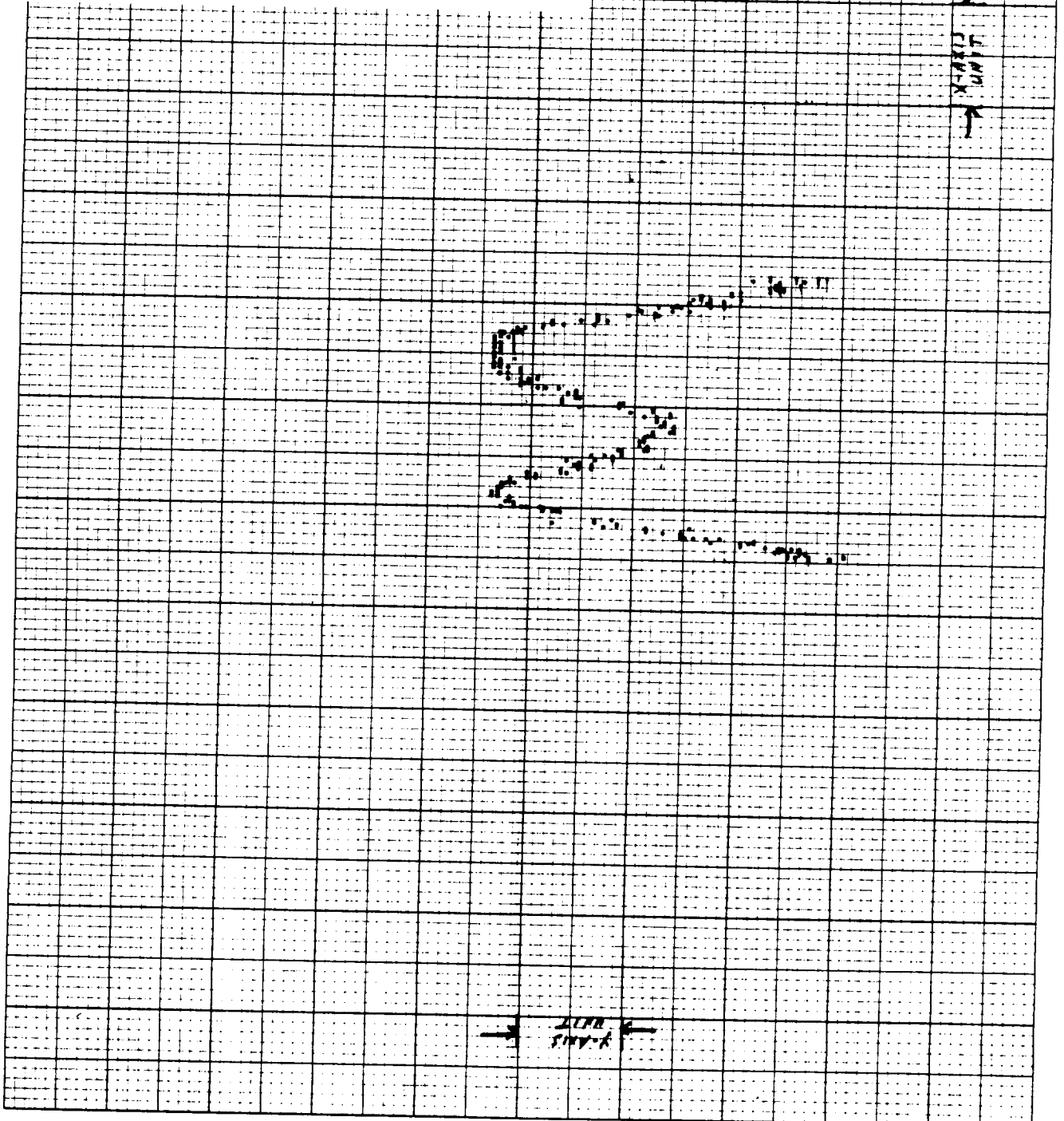
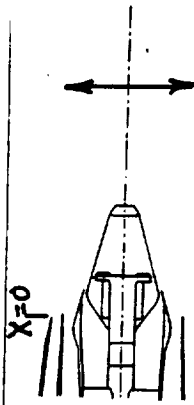


DATE: 6/8/83	NOZZLE: T45-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 114.0	
PLOT IDENTIFICATION : G - 222	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	
RADIAL REF. (C) -	VOLTS $R =$
LOCATIONS: TRAVERSE	VOLTS $R_2 =$
RADIAL $\Delta$ : E.W. - $\Delta$ ; N.S. - <input type="checkbox"/>	
AXIAL REF. $\Delta$ - 1831 VOLTS $X = 40$	
LOCATIONS: TRAVERSE - 2167	VOLTS $D_{eq} =$
SCALE : X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



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DATE: 6/8/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2	ACOUSTIC - 1140
PLOT IDENTIFICATION: G - 223	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : $\downarrow$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE - VOLTS $R_2$	RADIAL X : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. (A) - VOLTS $X$	LOCATIONS: TRAVERSE - VOLTS $D$
SCALE : X-AXIS = 3.317	INCH/UNIT
Y-AXIS = 390	F.P.S./UNIT
HISTOGRAMS: H- TO H-	



Y-AXIS  
UNIT

Y-AXIS  
UNIT

DATE: 6/8/83 NOZZLE: TA-5-11

TEST POINT: L.V. - 2 ; ACOUSTIC - 1140

PLOT IDENTIFICATION: G-224

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET: ☐

RADIAL REF. (C) VOLTS R =

LOCATIONS: TRAVERSE VOLTS R2

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (X) VOLTS X = 8.0

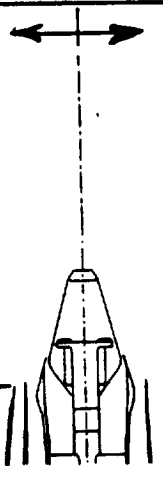
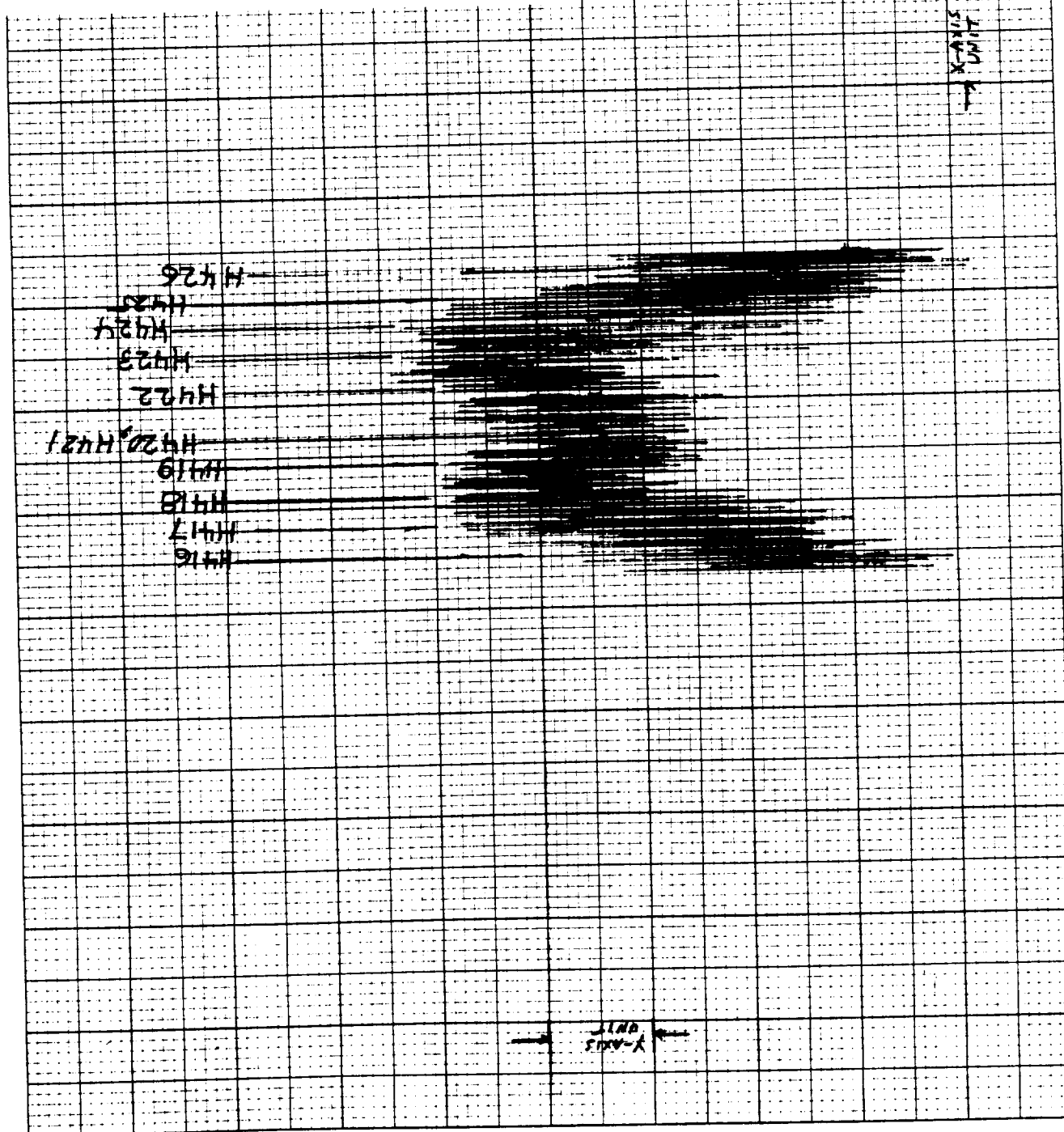
LOCATIONS: TRAVERSE - 2.49

SCALE: X-AXIS: 3.317 INCH/UNIT

Y-AXIS: 390 F.P.S./UNIT

HISTOGRAMS: H-416 TO H-426

XFO

DATE: 6/8/83 NOZZLE: TFS-11

TEST POINT: L.V. - 2 ; ACOUSTIC - 1140

PLOT IDENTIFICATION : G - 225

TRAVERSE DETAILS.

AXIAL ☐ :  $\phi$  - ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL  $\lambda$  : E.W. -  $\lambda$  ; N.S. - ☐

AXIAL REF. (X-0) - 1.83 VOLTS  $X$  - 8.0

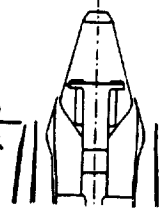
LOCATIONS: TRAVERSE - 2.49 VOLTS  $D$  - 8.0

SCALE : X-AXIS - 3.317 INCH/UNIT

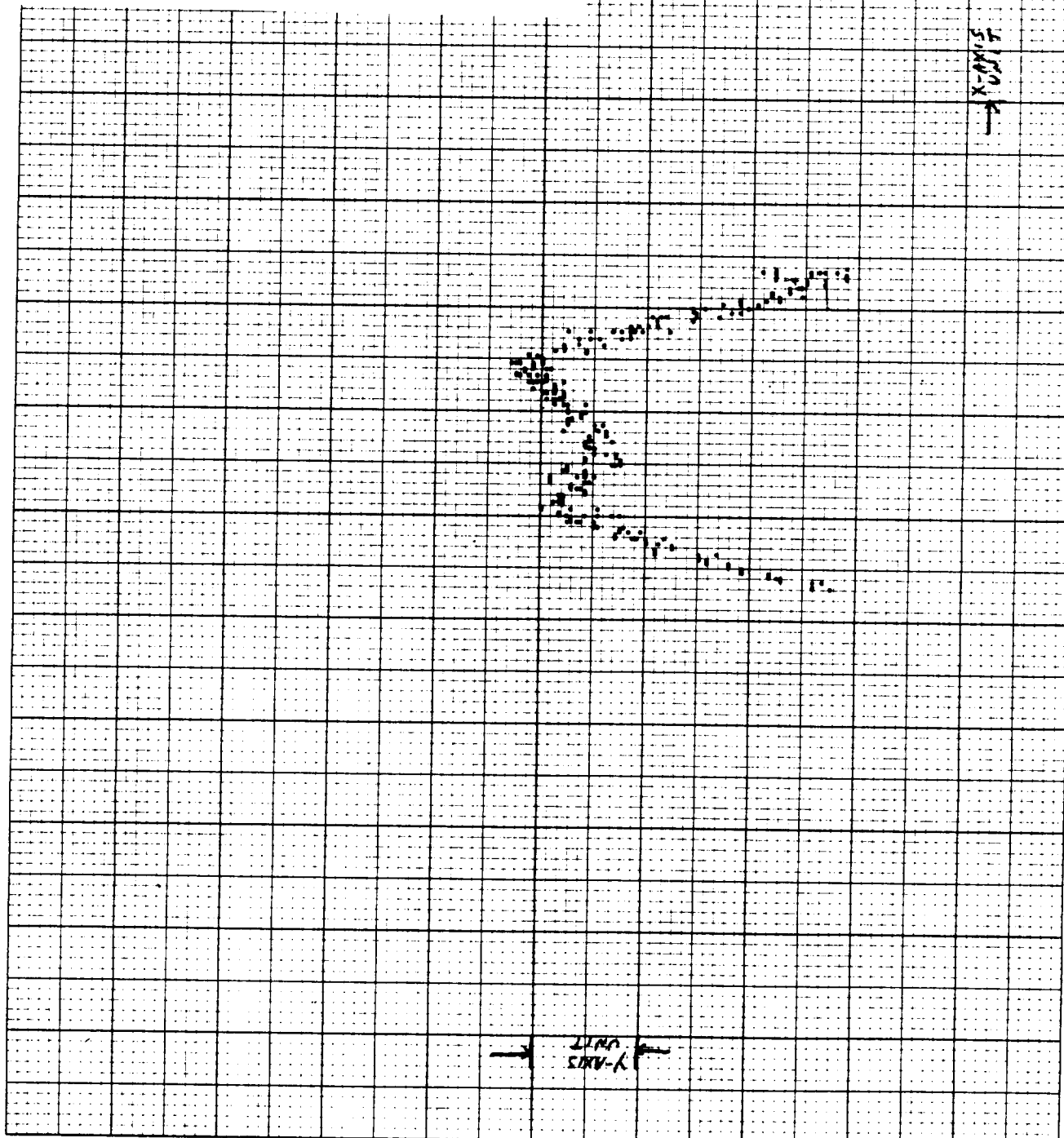
Y-AXIS - 390 F.P.S./UNIT

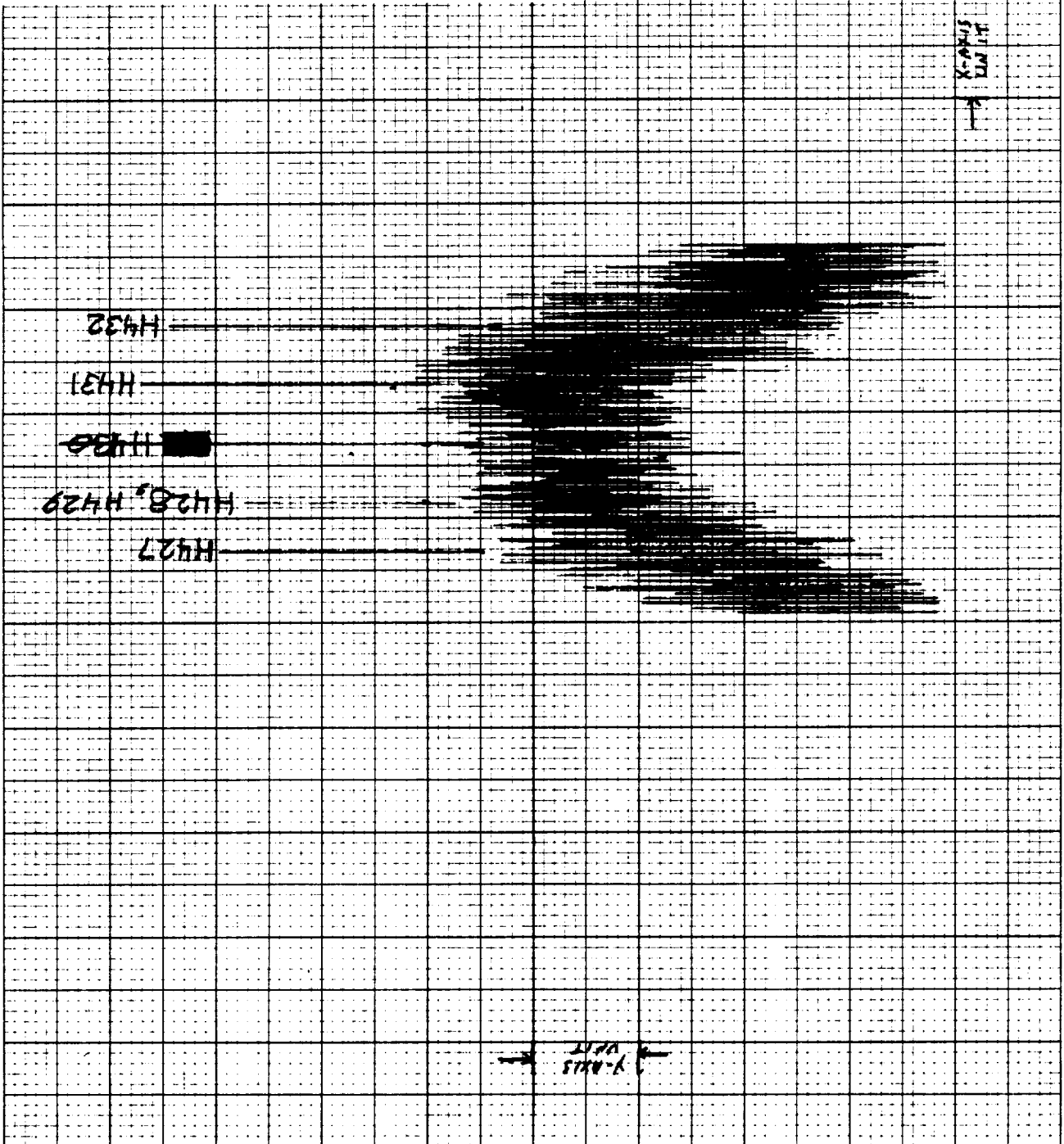
HISTOGRAMS: H- TO H-

X-90



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DATE: 6/8/83 NOZZLE: TAS-11

TEST POINT: L.V. - 2 ; ACOUSTIC - 1140

PLOT IDENTIFICATION: G - 226

TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (d) - VOLTS R =

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (d) - 1.831 VOLTS X 10

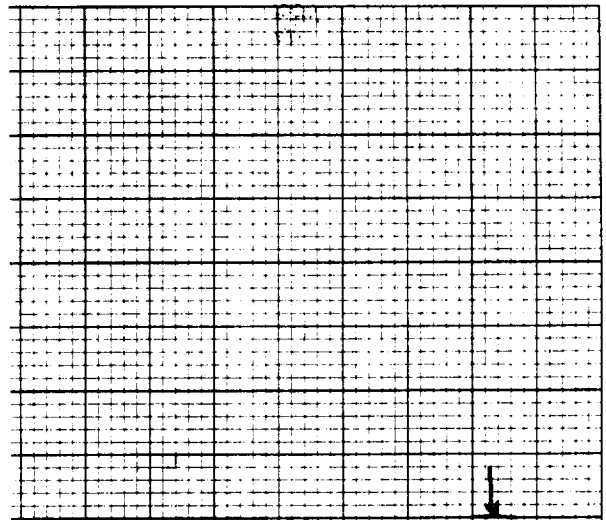
LOCATIONS: TRAVERSE 2.665 VOLTS D<sub>eq</sub>

SCALE : X-AXIS=3.317 INCH/UNIT

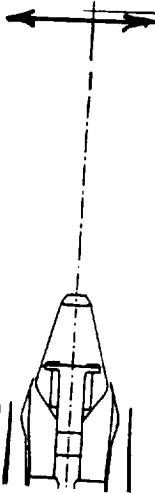
Y-AXIS=390 F.P.S./UNIT

HISTOGRAMS: H-427 TO H-432

X=0

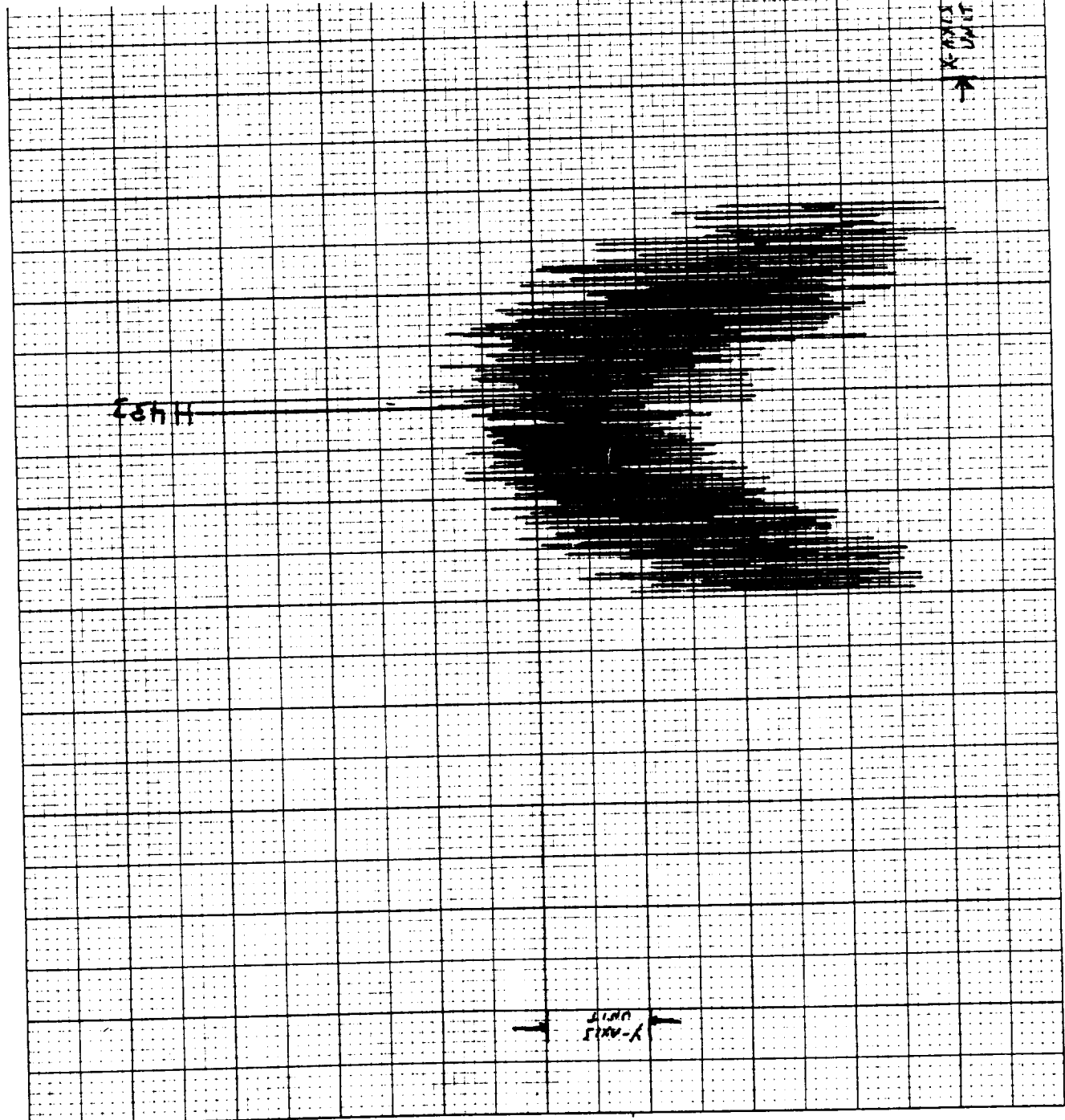
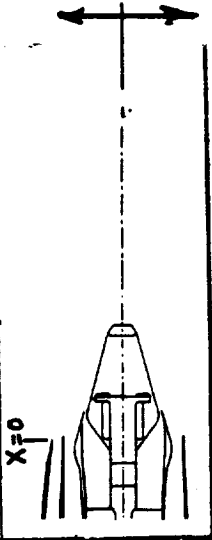


DATE 6/8/83 NOZZLE: TAS-11  
 TEST POINT: L.V. - 2 ; ACOUSTIC - 1140  
 PLOT IDENTIFICATION : G-227  
 TRAVERSE DETAILS:  
 AXIAL ☐ : ☒ ; OFFSET - ☐  
 RADIAL ☐ : ☒ ; REF. (C) - VOLTS  $R_1$   
 LOCATIONS: TRAVERSE - VOLTS  $R_2$   
 RADIAL ☒ : E.W. - ☒ ; N.S. - ☐  
 AXIAL REF. 180 - 1831 VOLTS  $X$   
 LOCATIONS: TRAVERSE 2.665 VOLTS  $D_{eq}$   
 SCALE : X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT  
 HISTOGRAMS: H- TO H-



X-AXIS  
UNIT

DATE: 6/8/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2	ACOUSTIC - 1140
PLOT IDENTIFICATION: 6-228	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL <input type="checkbox"/> : <input type="checkbox"/> ; VOLTAGE <input type="checkbox"/>
LOCATIONS: REF. (C) -	LOCATIONS: REF. (C) -
RADIAL <input checked="" type="checkbox"/> : E.N. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	RADIAL <input checked="" type="checkbox"/> : E.N. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. (C) - 189/	AXIAL REF. (C) - 189/
LOCATIONS: TRAVERSE - 2.83/	LOCATIONS: TRAVERSE - 2.83/
SCALE: X-AXIS - 3.317	SCALE: X-AXIS - 3.317
Y-AXIS - 390	Y-AXIS - 390
HISTOGRAMS: H- 433 TO H- 1	HISTOGRAMS: H- 433 TO H- 1





DATE: **6/8/83** NOZZLE: **TAS-11**

TEST POINT: **L.V. - 2** ; ACOUSTIC - **1140**

PLOT IDENTIFICATION: **6-229**

TRAVERSE DETAILS.

AXIAL ☐ :  $\phi$  - ☐ ; OFFSET - ☐

RADIAL REF. ( $\phi$ ) - VOLTS  $R$

LOCATIONS: TRAVERSE VOLTS  $R^2$

RADIAL  $\phi$  : E.M. -  $\phi$  ; M.S. - ☐

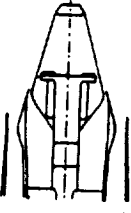
AXIAL REF. ( $\phi$ ) - VOLTS  $X$

LOCATIONS: TRAVERSE **2831** VOLTS  $D$  eq **12**

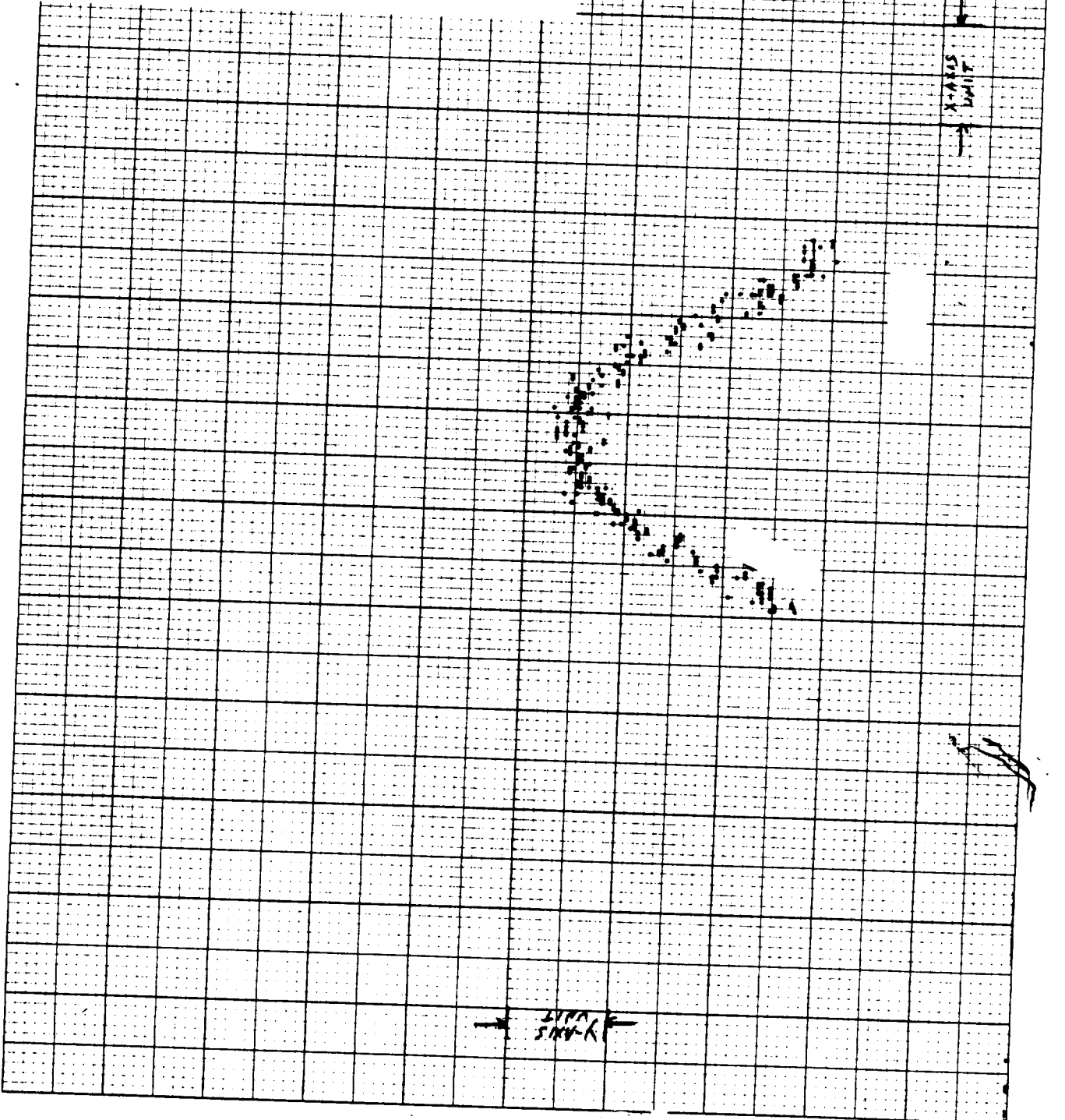
SCALE : X-AXIS = **3317** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

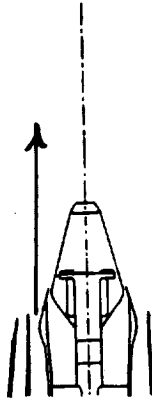
HISTOGRAMS: H- TO H-



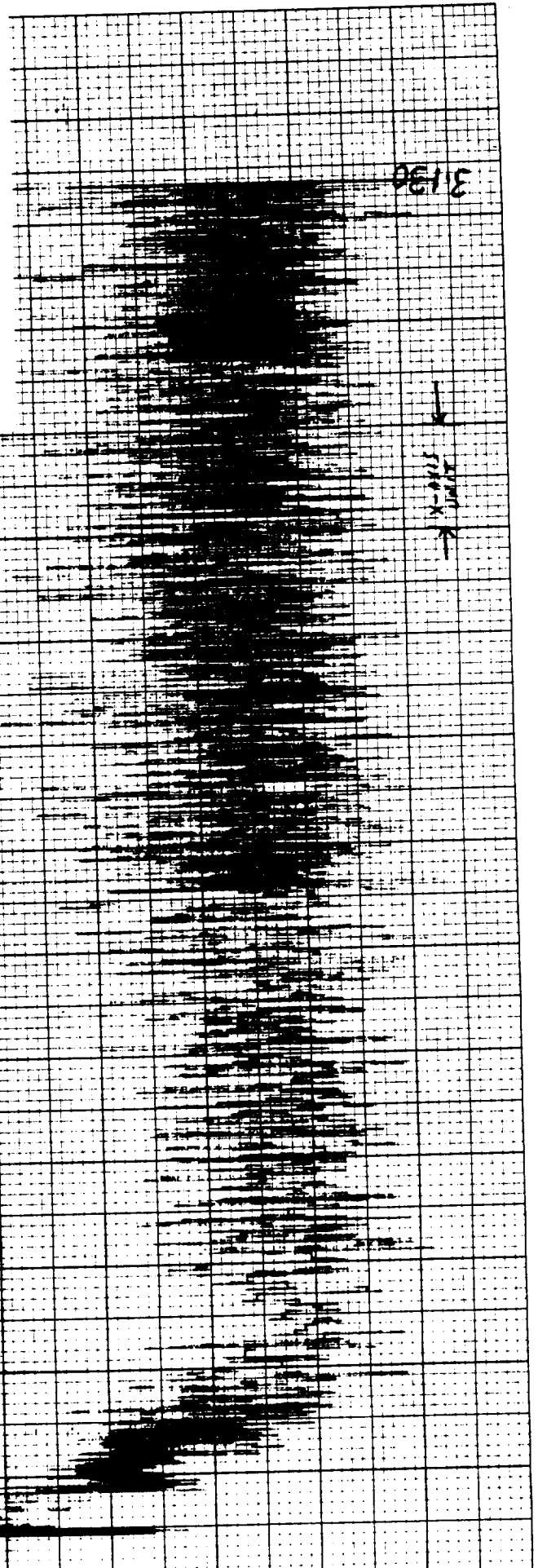
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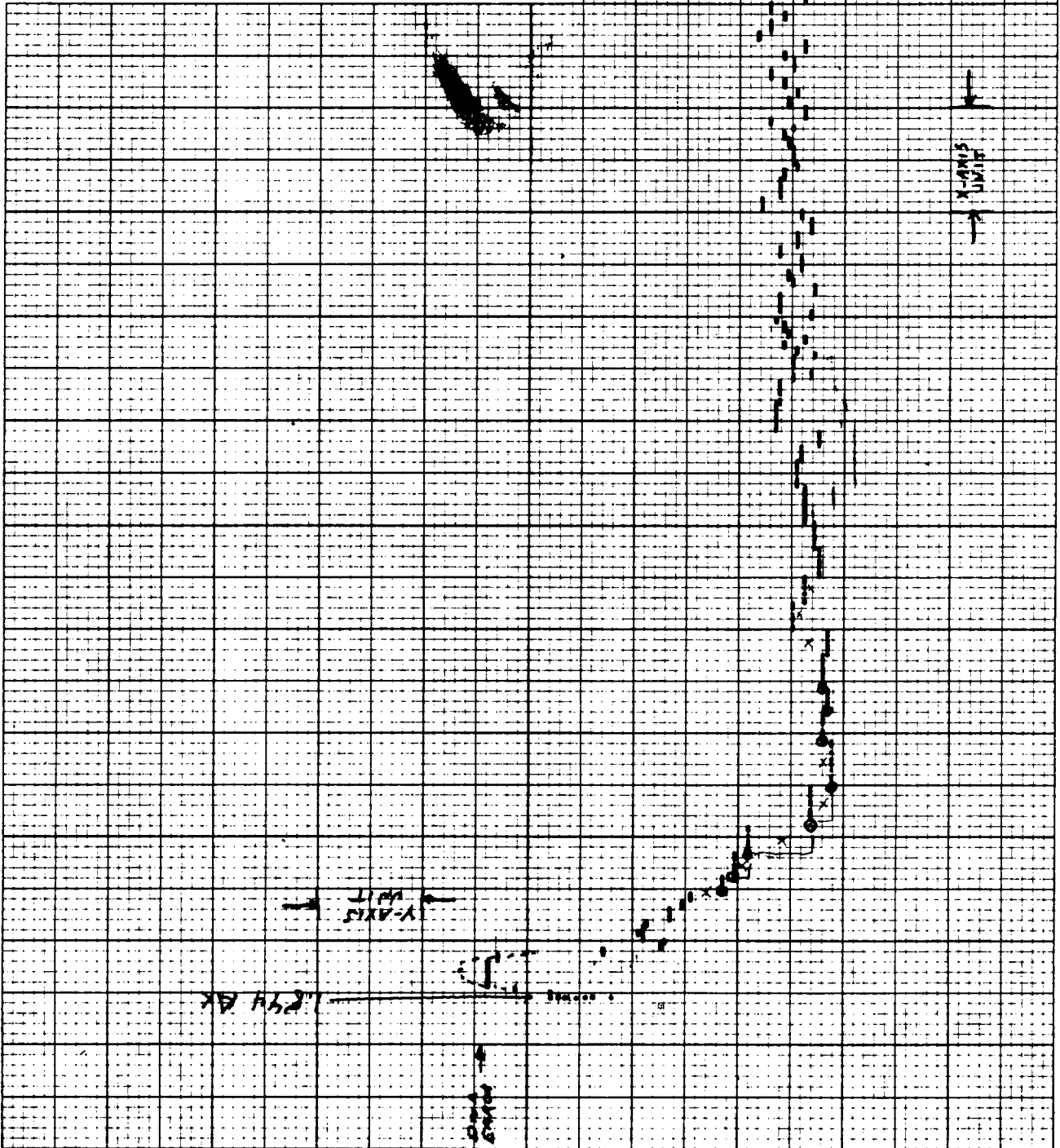
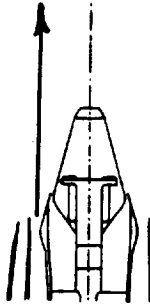
DATE: 6/8/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 1140	
PLOT IDENTIFICATION : G - 232	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - $\phi$	
RADIAL REF. ( $\phi$ ) - 6.803 VOLTS	R - 70
LOCATIONS: TRAVERSE - 8.280 VOLTS	R <sub>2</sub> - 70
RADIAL <input type="checkbox"/> : E.M. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS	$\frac{x}{d_{eq}}$ -
LOCATIONS: TRAVERSE - VOLTS	
SCALE : X-AXIS - 7.20 INCH/UNIT	
Y-AXIS - 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



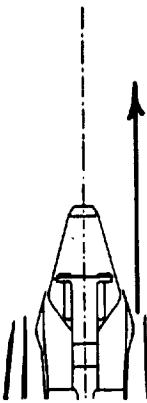
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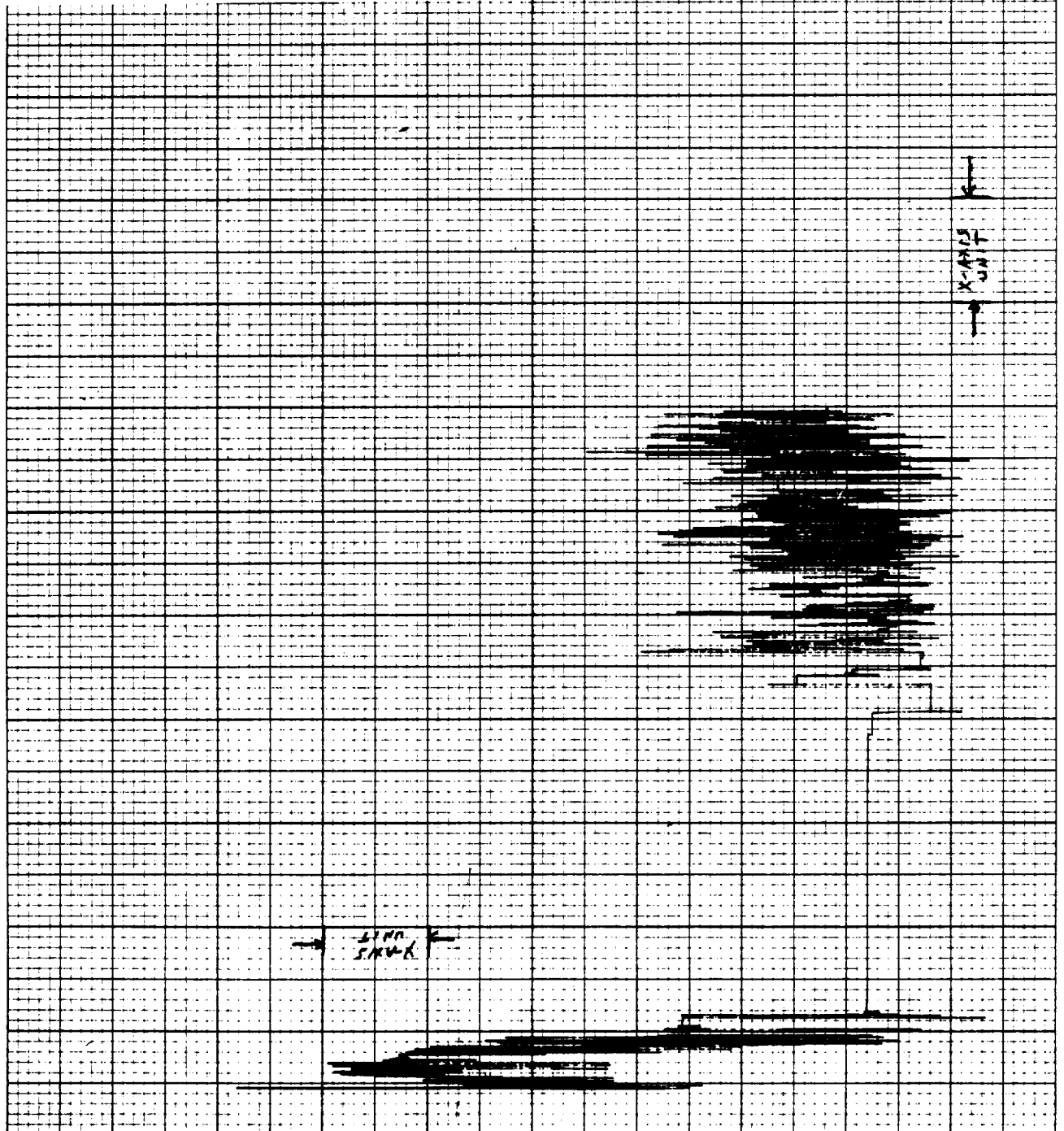


DATE: 6/8/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2	ACOUSTIC - 140
PLOT IDENTIFICATION: 6-233	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	
RADIAL REF. ( $\phi$ ) - 6.803 VOLTS	R $\approx$ 78
LOCATIONS: TRAVERSE - 8.280 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS	X
LOCATIONS: TRAVERSE - VOLTS	D
SCALE: X-AXIS = 720 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



3130

DATE: 6/8/83	NOZZLE: T45-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 1140	
PLOT IDENTIFICATION: 6-234	
TRAVERSE DETAILS.	
AXIAL <input checked="" type="checkbox"/> : $\downarrow$ - <input type="checkbox"/> ; OFFSET - 10	RADIAL REF. (C) - 6823 VOLTS $R_2$ - 78
LOCATIONS: TRAVERSE - 5.333 VOLTS $R_2$	RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF. ( ) - VOLTS $X =$	LOCATIONS: TRAVERSE - VOLTS $D =$ eq
SCALE: X-AXIS: 7.20 INCH/UNIT	Y-AXIS: 390 F.P.S./UNIT
HISTOGRAMS: H- TO H-	
	



DATE: 6/8/83 NOZZLE: TAs-11

TEST POINT: L.V. - 2 : ACOUSTIC - 1140

PLOT IDENTIFICATION: 6-235

TRAVERSE DETAILS.

AXIAL ☒ : ☐ : OFFSET - ☒

RADIAL REF. (C) - 6.813 VOLTS R = 70

LOCATIONS: TRAVERSE - 5.113 VOLTS R = 70

RADIAL : E.N. - ☐ : N.S. - ☐

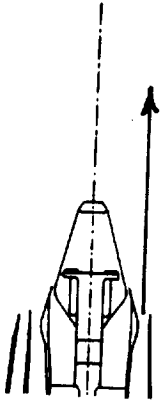
AXIAL REF. ( ) - VOLTS X

LOCATIONS: TRAVERSE - VOLTS D<sub>eq</sub>

SCALE: X-AXIS = 7.20 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

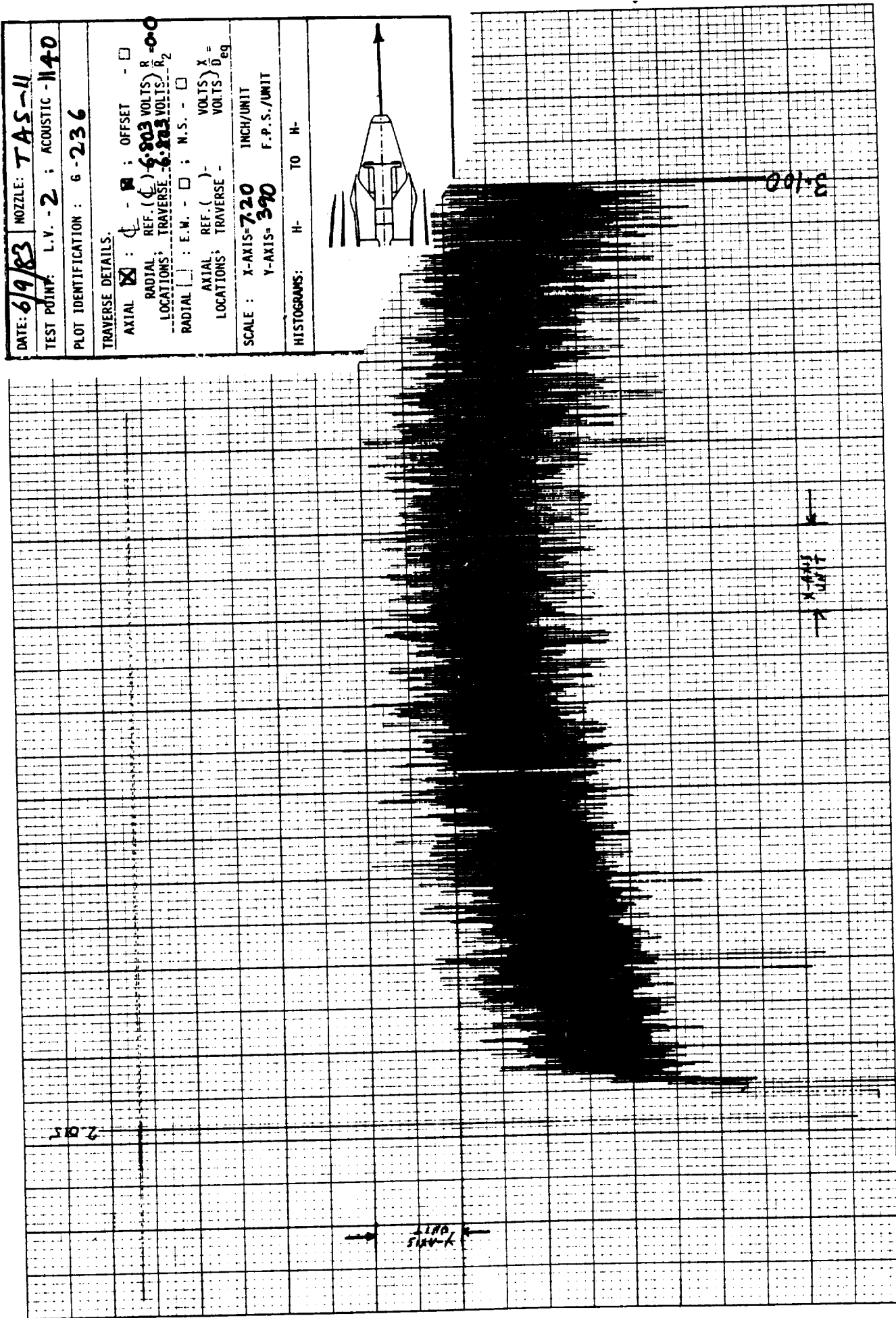
HISTOGRAMS: H- TO H-



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4.1113

Y-AXIS



DATE: **6/9/83** NOZZLE: **TAS-11**

TEST POINT: **L.V. - 2** ; ACOUSTIC - **1140**

PLOT IDENTIFICATION : **6-236**

TRAVERSE DETAILS.

AXIAL ☒ : ☒ : OFFSET - ☐

RADIAL REF. ( ☒ ) **6.803** VOLTS <sub>R</sub> **0-0**

LOCATIONS: TRAVERSE **6.803** VOLTS <sub>R2</sub>

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

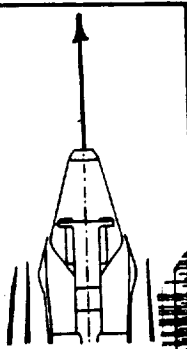
AXIAL REF. ( ) - VOLTS <sub>X</sub>

LOCATIONS: TRAVERSE - VOLTS <sub>0</sub>

SCALE : X-AXIS = **7.20** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

HISTOGRAMS: H- TO H-



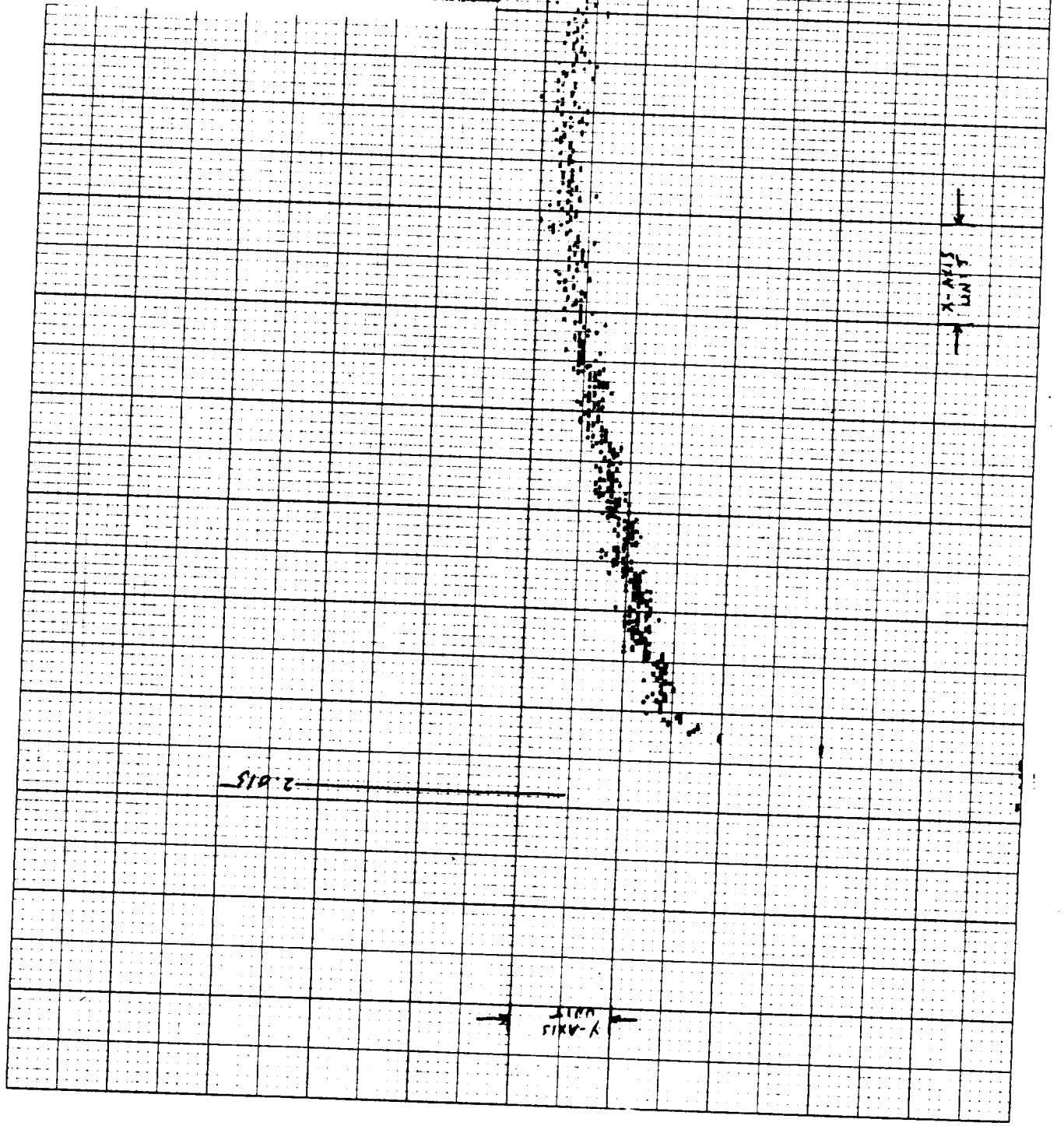
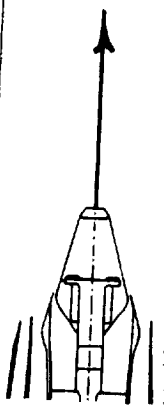
DATE: 6/9/83 NOZZLE: TAS-11  
 TEST POINT: L.V. - 2; ACOUSTIC - 1140  
 PLOT IDENTIFICATION: G-237

TRAVERSE DETAILS:

AXIAL ☒ : ☐ : OFFSET - ☐  
 RADIAL REF. (C) - 6.803 VOLTS, R = 0.0  
 LOCATIONS: TRAVERSE - 6.803 VOLTS, R = 0.0  
 RADIAL : E.W. - ☐ ; N.S. - ☐  
 AXIAL REF. ( ) - VOLTS  $\frac{X}{D}$  =  
 LOCATIONS: TRAVERSE - VOLTS  $\frac{X}{D}$  =

SCALE : X-AXIS = 7.20 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

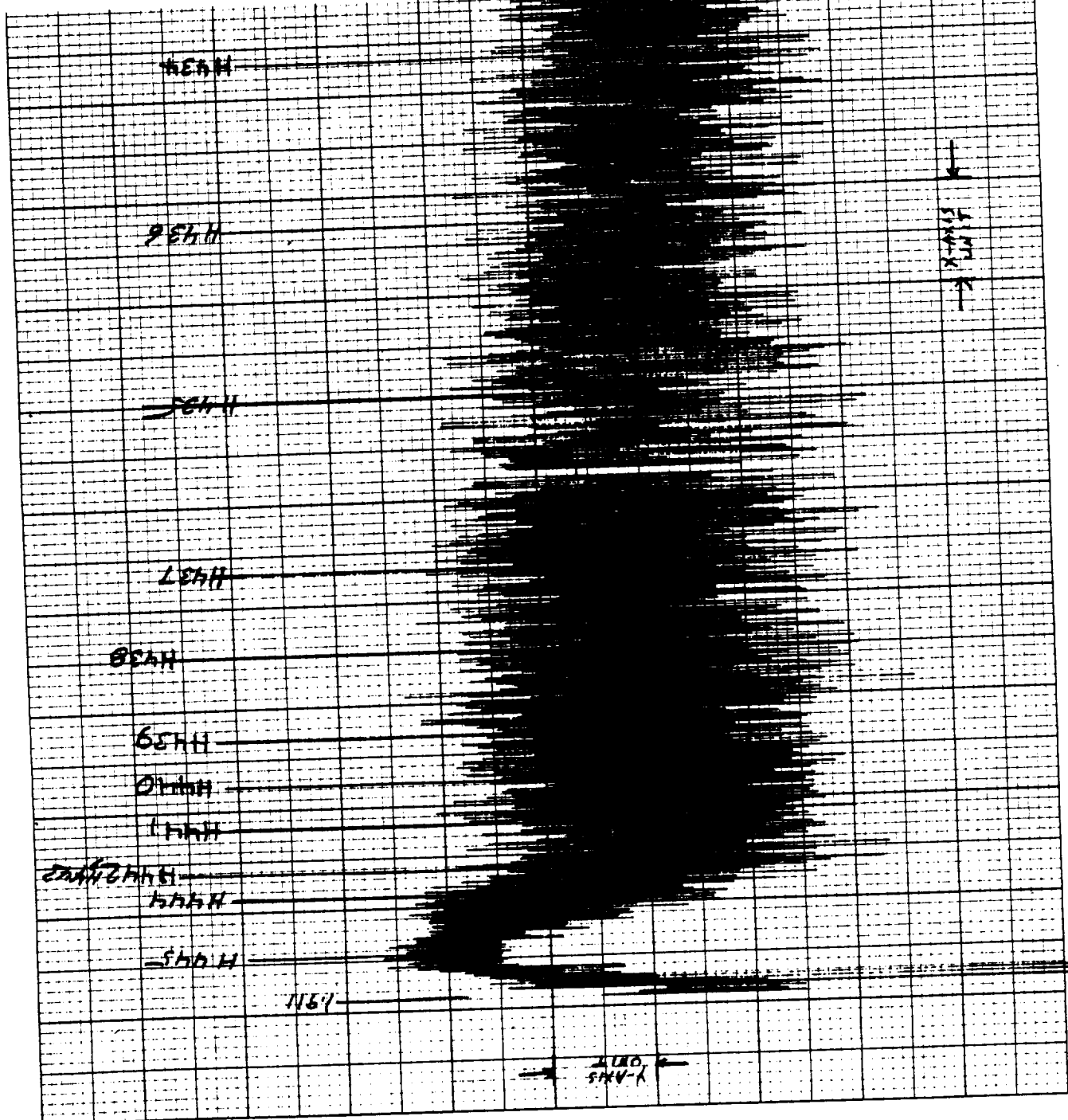
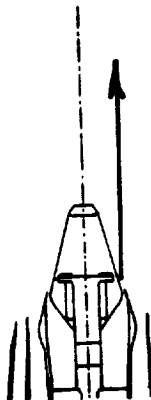


3.100

X-AXIS  
UNIT



DATE: 6/9/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2	ACOUSTIC - 1140
PLOT IDENTIFICATION: G - 238	
TRAVERSE DETAILS.	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> ; OFFSET - 11	
RADIAL REF. (C) - 6.803 VOLTS	R - 5
LOCATIONS: TRAVERSE - 5.872 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.M. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL LOCATIONS: TRAVERSE -	VOLTS) X =
	VOLTS) D <sub>eq</sub>
SCALE: X-AXIS - 720	INCH/UNIT
Y-AXIS - 390	F.P.S./UNIT
HISTOGRAMS: H-434 TO H-445	





DATE: 6/9/83 NOZZLE: TAS-11

TEST POINT: L.V. - 2; ACOUSTIC - 1140

PLOT IDENTIFICATION: G-239

TRAVERSE DETAILS:

AXIAL ☒ : ☐ : OFFSET - X

RADIAL REF. (C) - 6.803 VOLTS R = 5

LOCATIONS: TRAVERSE - 5.870 VOLTS R<sub>2</sub>

RADIAL ☐ : E.W. - ☐ : N.S. - ☐

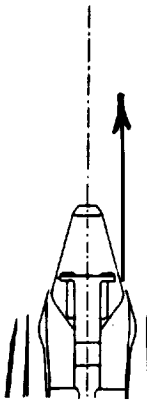
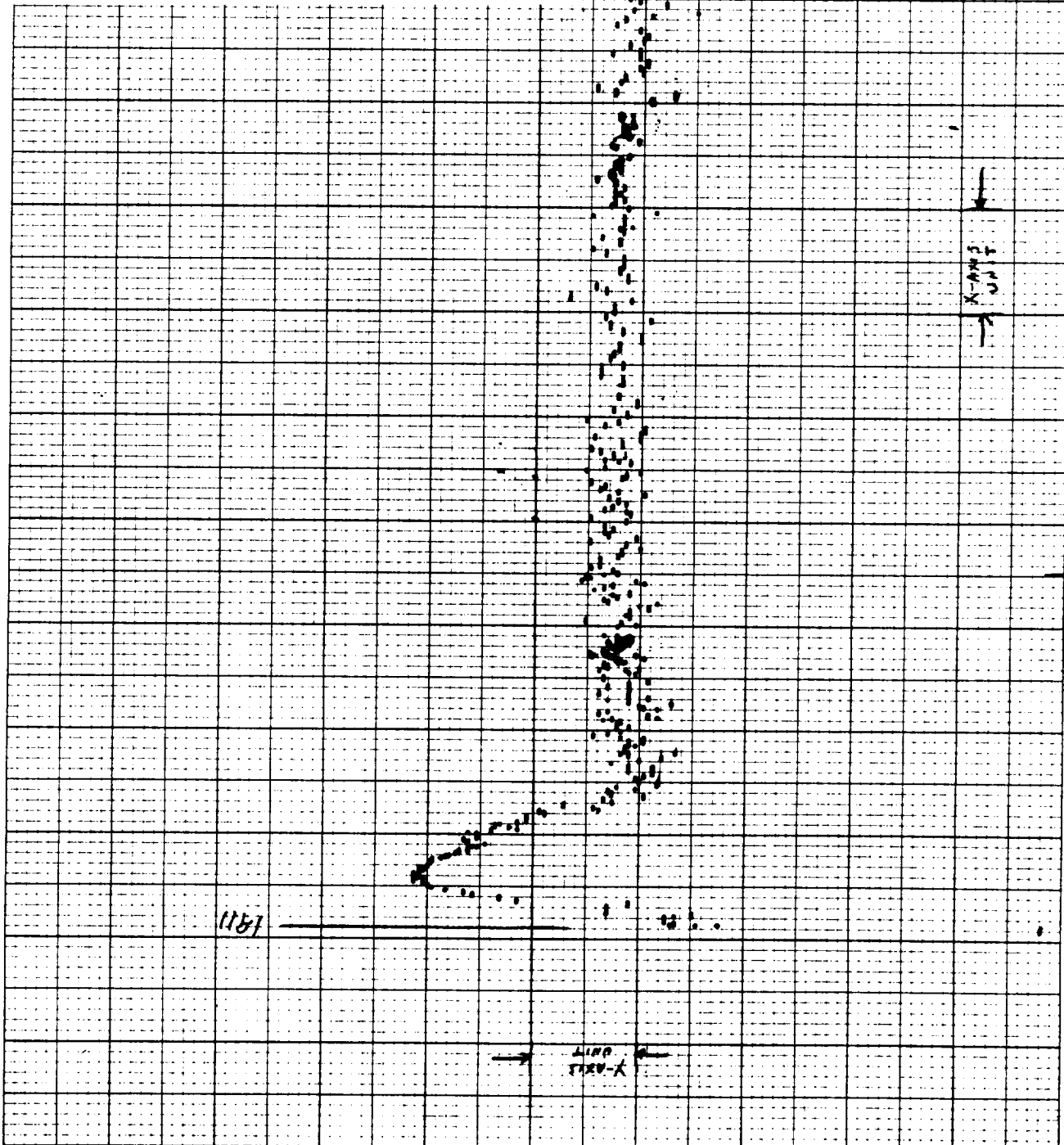
AXIAL REF. ( ) - VOLTS X

LOCATIONS: TRAVERSE - VOLTS D<sub>eq</sub>

SCALE : X-AXIS = 7.20 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

DATE: 6/9/83 NOZZLE: T45-11

TEST POINT: L.V. - 2 : ACOUSTIC - 1140

PLOT IDENTIFICATION: G-240

TRAVERSE DETAILS:

AXIAL ☒ : ☐ : OFFSET - 12

RADIAL REF. (C) - 6803 VOLTS R

LOCATIONS: TRAVERSE: 7.750 VOLTS R<sub>2</sub> - 0.5

RADIAL ☐ : E.W. - ☐ : N.S. - ☐

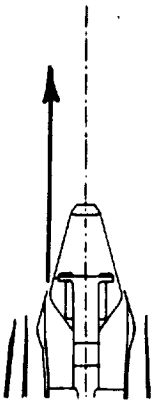
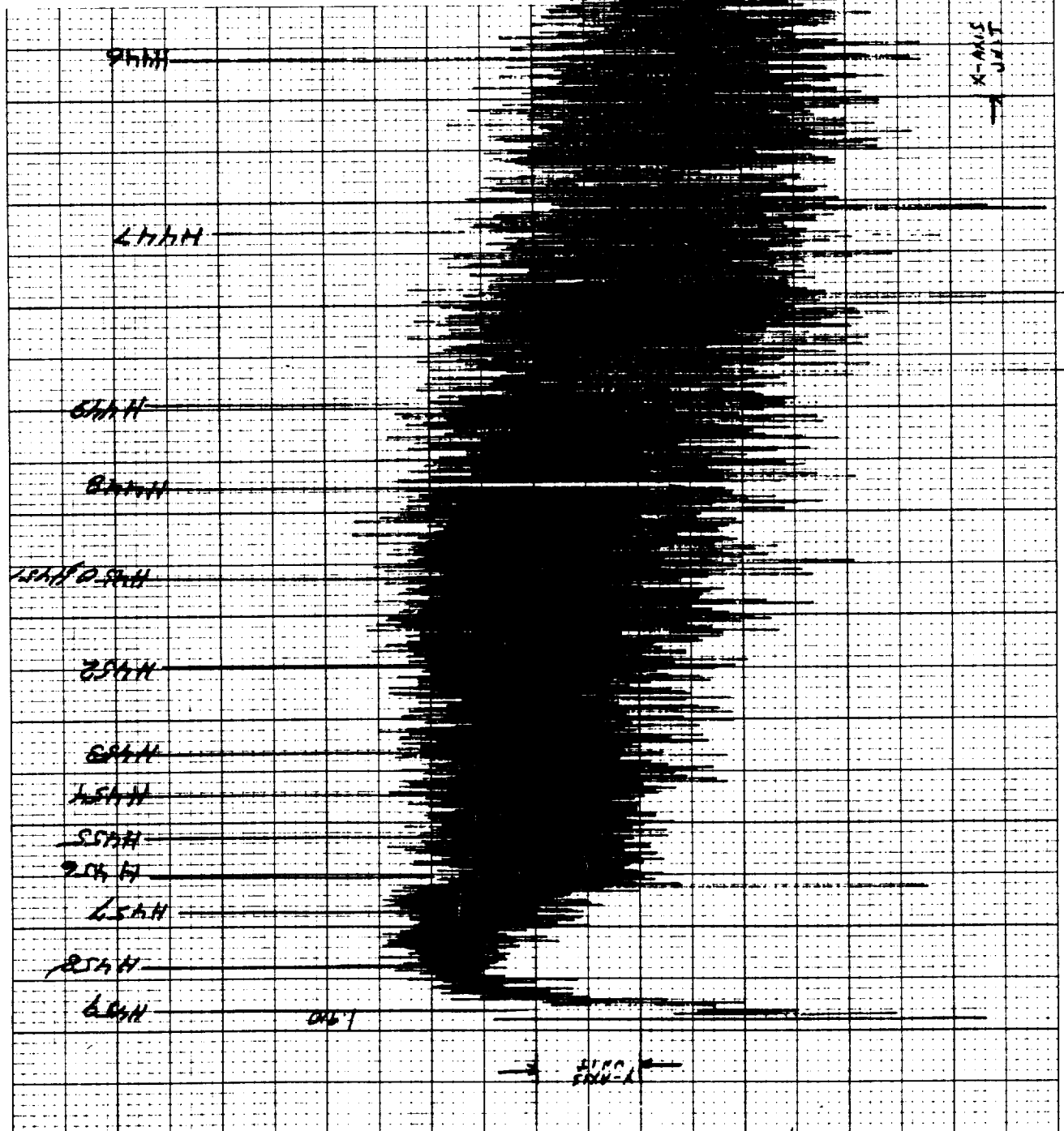
AXIAL REF. ( ) - VOLTS X<sub>eq</sub>

LOCATIONS: TRAVERSE - VOLTS D<sub>eq</sub>

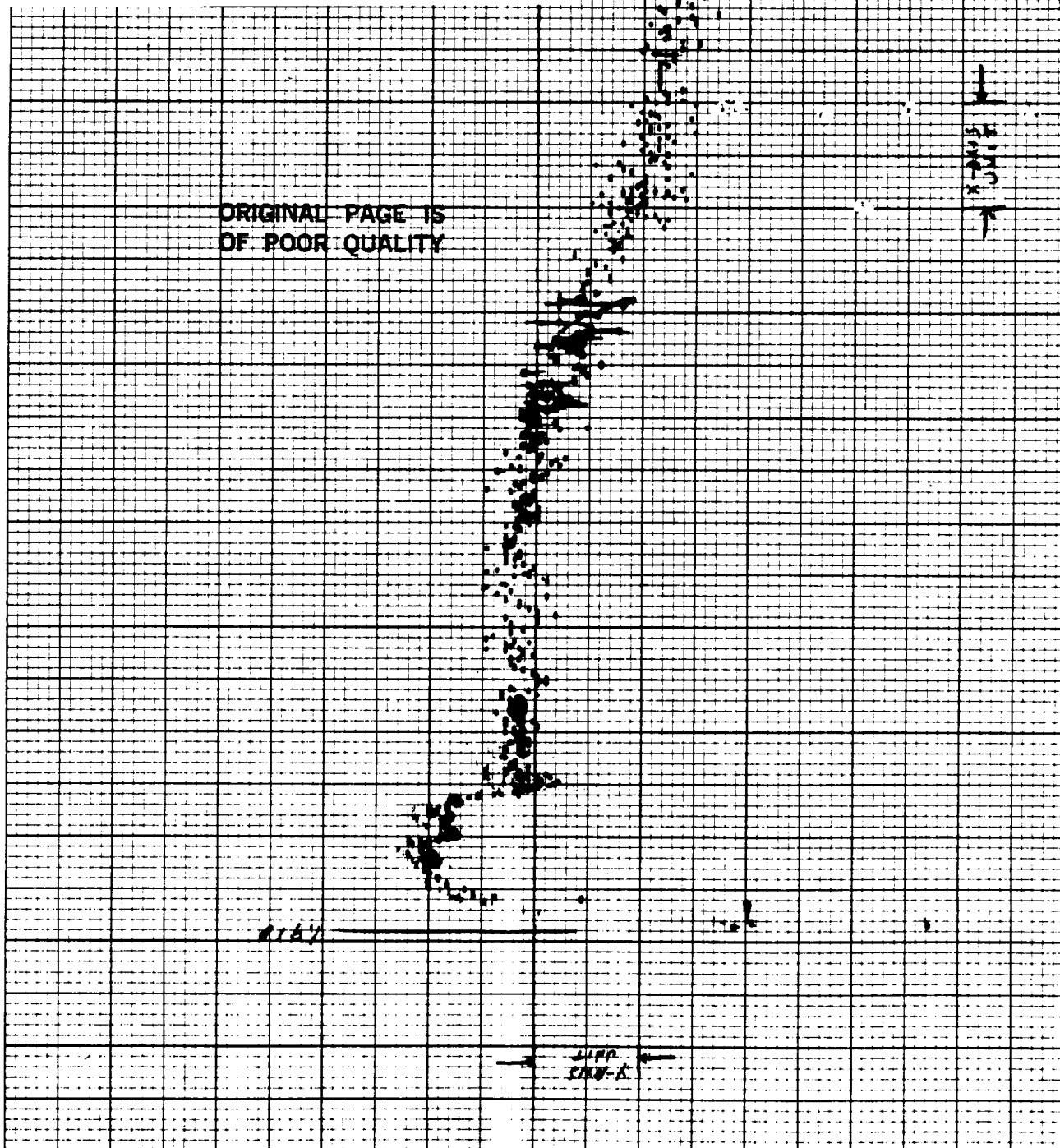
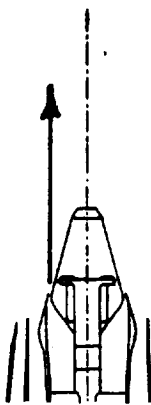
SCALE: X-AXIS = 7.20 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

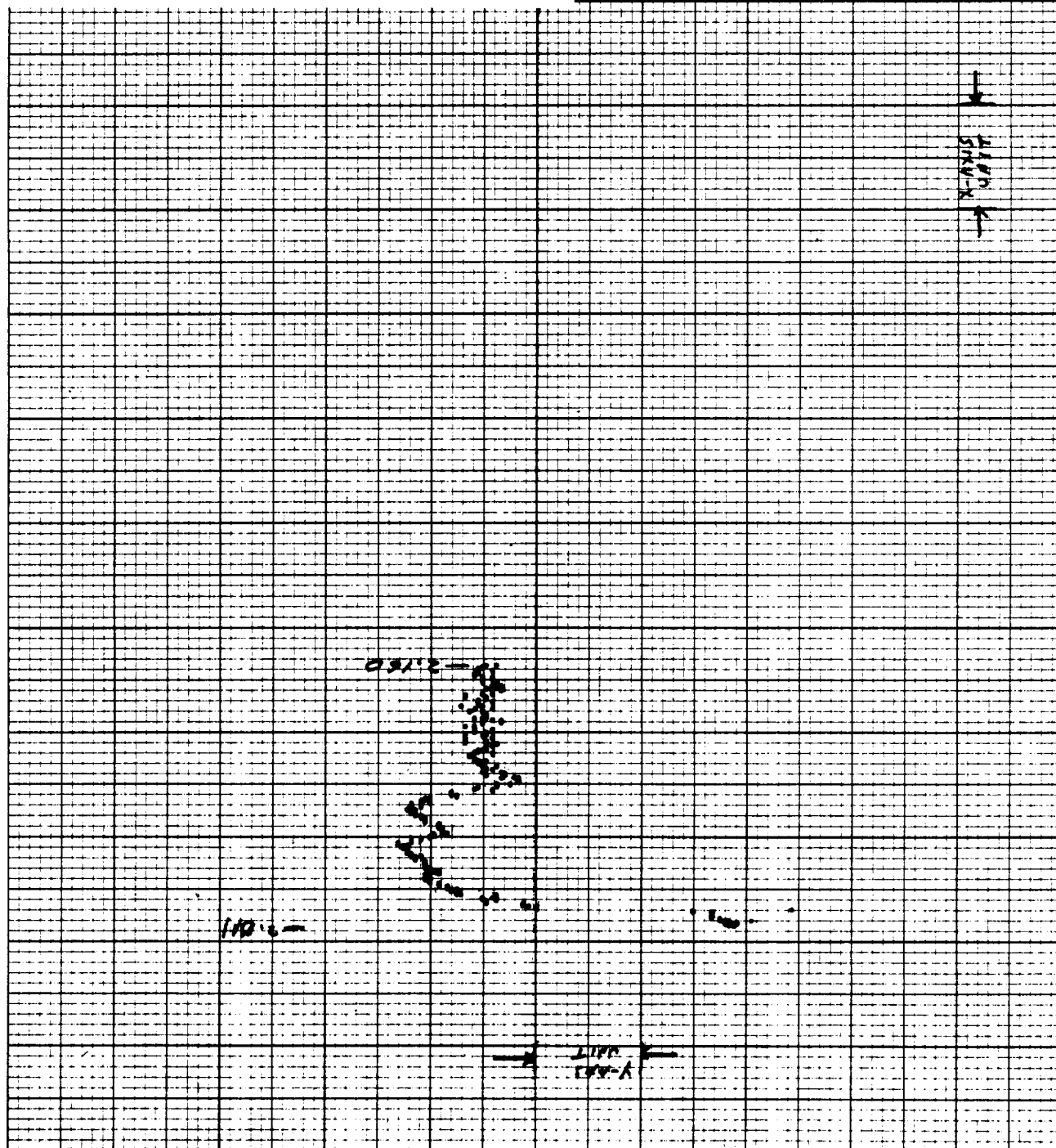
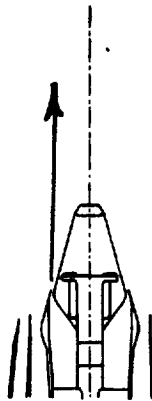
HISTOGRAMS: H-446 TO H-459

DATE: 6/9/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2	ACOUSTIC - 1140
PLOT IDENTIFICATION: 6-241	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - $\pi$	
RADIAL REF. (C) - 6003 VOLTS $R_2$	
LOCATIONS: TRAVERSE - 7.50 VOLTS $R_2$	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS $X$	
LOCATIONS: TRAVERSE - VOLTS $D_{eq}$	
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: 6/9/83	NOZZLE: TAS-11
TEST POINT: L.V. - 2 ; ACOUSTIC - 140	
PLOT IDENTIFICATION: G-241 REPEAT	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\downarrow$ ; OFFSET - 14	
RADIAL REF. ( ) : 6803 VOLTS	R <sub>2</sub> = .5
LOCATIONS: TRAVERSE: 7300 VOLTS	
RADIAL <input type="checkbox"/> : E.M. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) : VOLTS	X <sub>deg</sub> =
LOCATIONS: TRAVERSE - VOLTS	
SCALE : X-AXIS: 720 INCH/UNIT	
Y-AXIS: 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: 6/9/83 NOZZLE: T45-11

TEST POINT: L.V. - 2 ; ACOUSTIC - 1140

PLOT IDENTIFICATION: G - 242

TRAVERSE DETAILS.

AXIAL ☐ : ☐ - ☐ : OFFSET - ☐

RADIAL REF. (C) - VOLTS R -

LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (X) - VOLTS X - 6

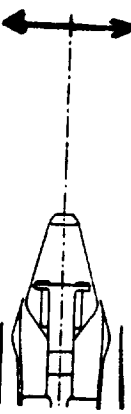
LOCATIONS: TRAVERSE - 2334 VOLTS D<sub>eq</sub>

SCALE : X-AXIS= 3.317 INCH/UNIT

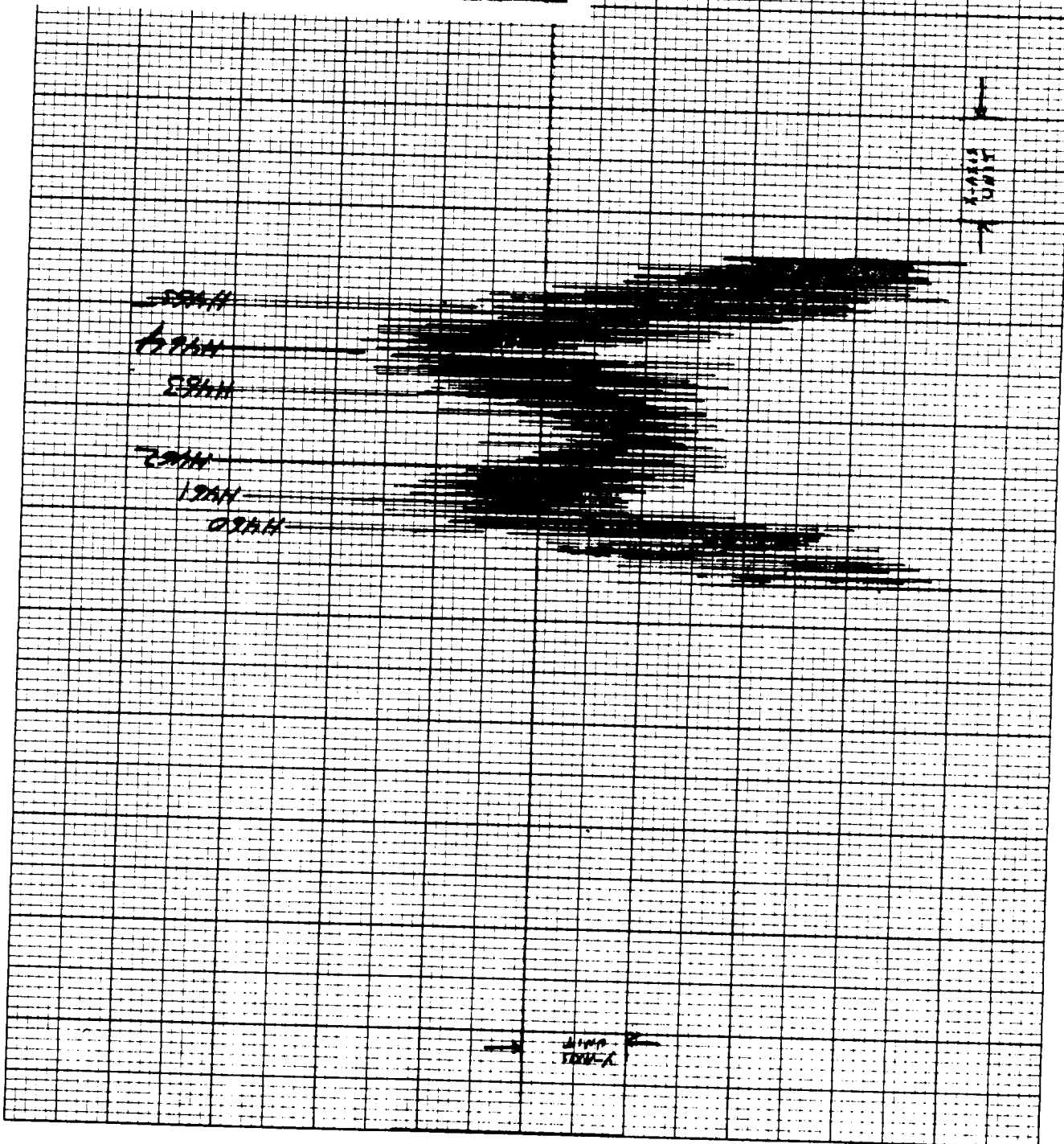
Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- 160 TO H- 465

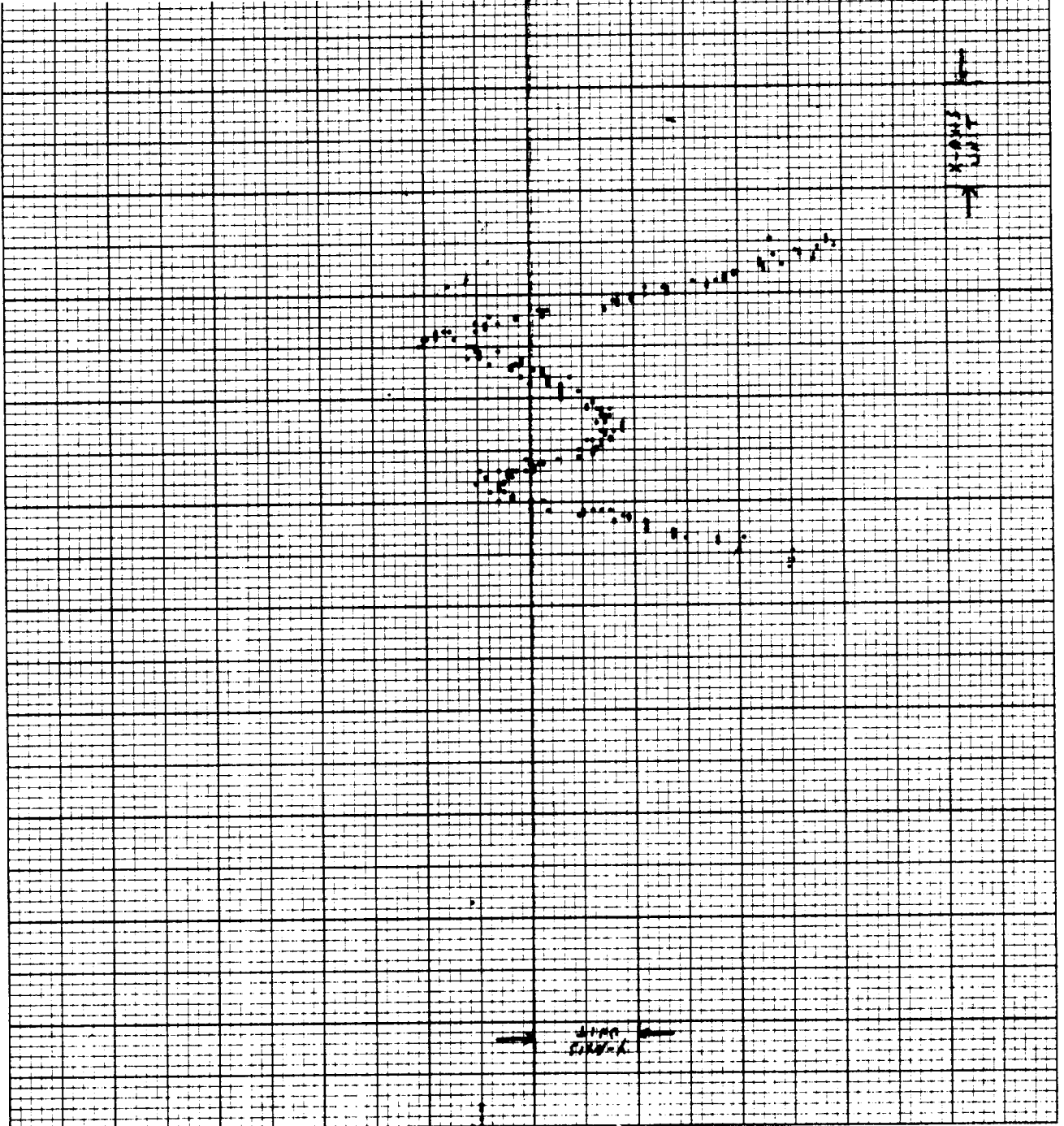
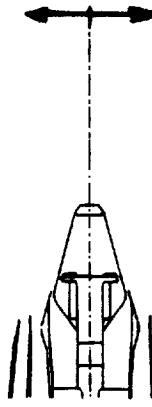
X<sub>20</sub>



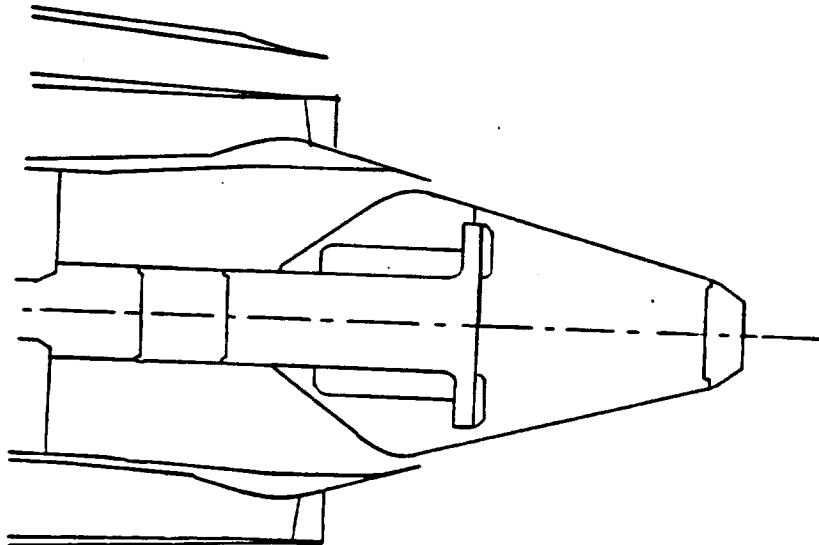
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OF POOR QUALITY



DATE: <b>6/9/83</b>	NOZZLE: <b>TAS-11</b>
TEST POINT: <b>L.V. - 2</b>	ACOUSTIC - <b>140</b>
PLOT IDENTIFICATION: <b>6 - 243</b>	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE -	VOLTS $R_2$
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	AXIAL REF. <b>0-0-1-831</b> VOLTS $X$ - <b>6.0</b>
LOCATIONS: TRAVERSE - <b>2.334</b> VOLTS $D_{eq}$	SCALE: X-AXIS = <b>3.317</b> INCH/UNIT
	Y-AXIS = <b>370</b> F.P.S./UNIT
HISTOGRAMS: H- TO H-	



5.4.2 LV Data of Suppressed Coannular Plug Nozzle with 180° Thermal Acoustic Shield (TAS-16)



The Test Points are Made Up of One Static and One Simulated Flight Point (LV Test Points 3 and 4) at Typical Takeoff Condition (See Table 5-I for Aerodynamic Conditions).

LASER VELOCIMETER TEST POINT 3



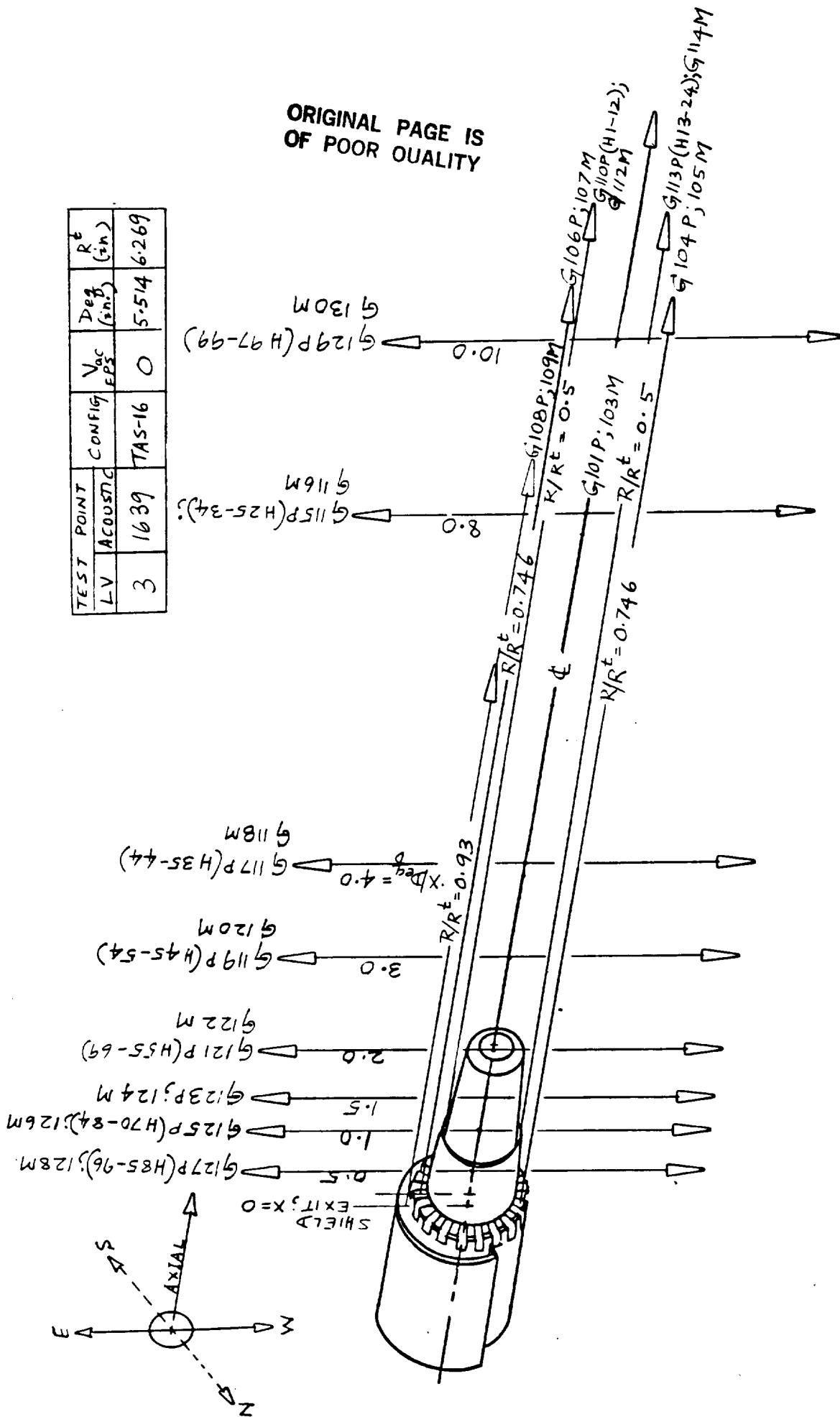
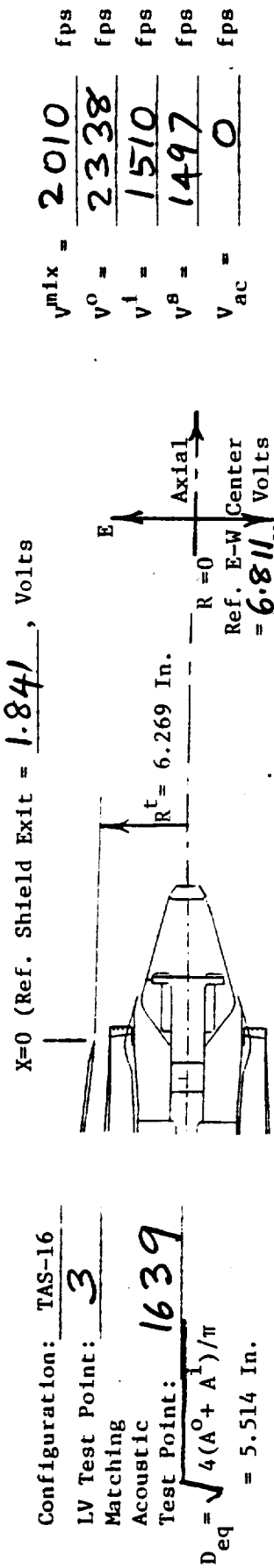


Figure 5.4 Pictorial Representation of Scope of LV Measurement on Configuration TAS-16 for LV Test Point 3. (Matching Acoustic Test Point 1639, Static, Takeoff Condition). (Repeat).

Table 5-IV. Laser Velocimeter Measurement Data



Graph Number	Pen	Mini	Traverse (X, Y, Z)	Histogram Number	Location (X and R)				Velocity (V and V')			Comments
					Volts	Inches		Normalized	Feet/Sec.	Normalized		
					Axial	E-W	Axial	E-W	$\bar{V}$	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
101		103	AXIAL	-	-	6.811	-	0.0	-	-	-	NOZZLE AXIS
104		105	AXIAL	-	-	5.403	-	4.67	-	-	-	WEST
106		107	AXIAL	-	-	8.219	-	4.67	-	-	-	EAST
108		109	AXIAL	-	-	8.564	-	5.81	-	-	-	EAST
110		112	AXIAL	-	-	7.752	-	3.12	-	-	-	EAST
				001	2.470		4.525		1387	0.69	0.125	
				002	2.450		4.381		1463	0.728	0.120	
				003	2.373		38.27		1575	0.784	0.116	
				004	2.276		32.73		1669	0.830	0.111	
Y				005	2.296	Y	32.73	Y	167	0.833	0.112	Y

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Table 5-IV. Laser Velocimeter Measurement Data

Configuration: TAS-16

LV Test Point: 3

Matching

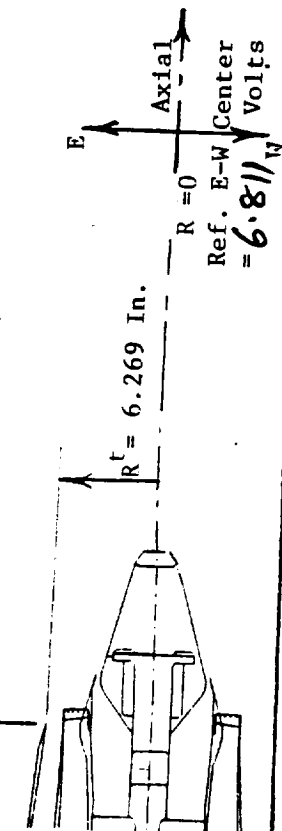
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.514 \text{ In.}$$

X=0 (Ref. Shield Exit = 1.841, Volts



$V^{mix} = 2010$  fps  
 $V^0 = 2338$  fps  
 $V^1 = 1510$  fps  
 $V^8 = 1497$  fps  
 $V_{ac} = 0$  fps

6.8114 Volts

FOR QUALITY

Graph Number		Pen	Mini	Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity ( $\bar{V}$ and $V'$ )				Comments	
						Volts		Inches		Normalized		Feet/Sec.			Normalized
						Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	$V'$	$\bar{V}/V^{mix}$	$V'/V^{mix}$
110					006	2.219	7.752	27.19	3.12	4.93	0.50	1785	209	0.888	0.104 EAST
					007	2.143		21.73		3.94		1890	180	0.940	0.09
					008	2.105		19.00		3.44		1933	163	0.962	0.081
					009	2.066		16.19		2.94		2016	160	1.003	0.08
					010	2.028		13.45		2.44		2044	155	1.017	0.077
					011	1.990		10.72		1.94		1989	158	0.99	0.079
					012	2.604		54.89		9.96		1266	228	0.63	0.113 Y
					-	-	-	-	-	-	-	-	-	-	-
					-	-	-	-	-	-	-	-	-	-	-
					-	-	-	-	-	-	-	-	-	-	-

**LV Test Point:**

### Matching

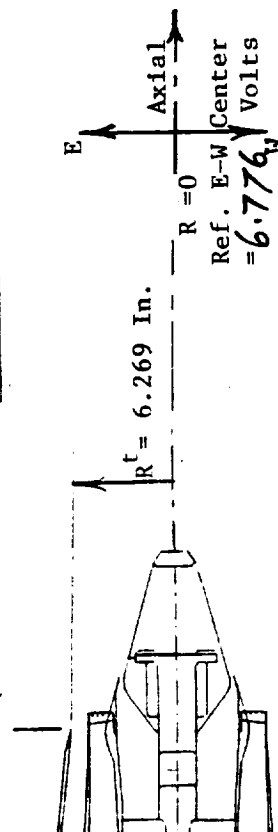
## Acoustic

Test Point: 16

$$D_{eq} = \sqrt{4(A^{\circ} + A^1) / \pi}$$

= 5.514 In.

X=0 (Ref. Shield Exit) = 1.836, Volts



$v_{mix} = \underline{2010}$  fps  
 $v^0 = \underline{2335}$  fps  
 $v^1 = \underline{1510}$  fps  
 $v^8 = \underline{1497}$  fps  
 $v_{ac} = \underline{0}$  fps

Graph Number		Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
Pen	Mini		Type (A-F-W)	Volts		Inches		Normalized		Feet/Sec.		Normalized $V'/V^{mix}$	
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$			V'
113	114	—	—	5.822	—	3.164	—	.50	—	—	—	—	West
		013	2.600		54.96		9.97			1273	190	0.633	0.095
		014	2.450		44.17		8.01			1313	178	0.653	0.089
		015	2.373		38.63		7.01			1337	199	0.665	0.100
		016	2.296		33.09		6.00			1368	193	0.681	0.096
		017	2.219		27.55		5.00			1415	189	0.704	0.094
		018	2.143		22.09		4.01			1470	183	0.731	0.091
		019	2.105		19.35		3.51			1485	190	0.739	0.095
		020	2.066		16.55		3.00			1496	207	0.744	0.103
		021	2.028		13.81		2.51			1603	234	0.798	0.116

Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836, Volts

Configuration: TAS-16

LV Test Point: 3

Matching

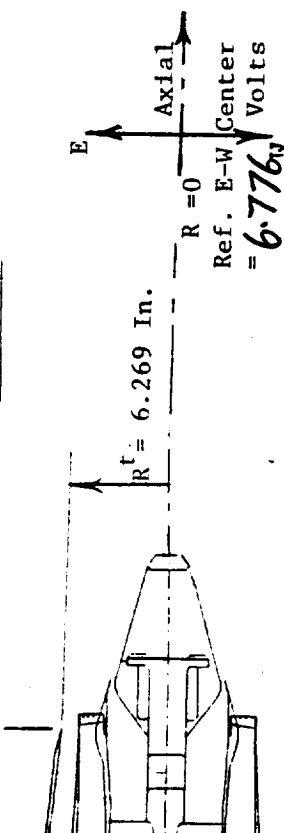
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} = \underline{2010}$  fps  
 $V^0 = \underline{2338}$  fps  
 $V^1 = \underline{1510}$  fps  
 $V^2 = \underline{1497}$  fps  
 $V_{nc} = \underline{0}$  fps



Graph Number		Type	Traverse (X-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
					Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
				022	1.990	5.822	11.08	3.165	2.01	0.50	1908	243	0.95	0.121	WEST
				023	1.951		8.27		1.50		1962	223	0.976	0.111	
				024	1.913		5.54		1.01		Insufficient Samples				
115	116		E-W	-	2.450	-	44.17	-	8.01	-	-	-	-	-	-
				025		5.292		4.922		0.785	978	200	0.487	0.10	WEST
				026		8.452		5.559		0.887	907	229	0.451	0.114	EAST
				027		8.210		4.756		0.759	1052	259	0.523	0.129	
				028		7.941		3.864		0.616	1297	278	0.645	0.138	
				029		7.687		3.022		0.482	1511	240	0.752	0.119	
				030		7.388		2.030		0.324	1613	188	0.803	0.094	

Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836, Volts

Configuration: TAS-16

LV Test Point: 3

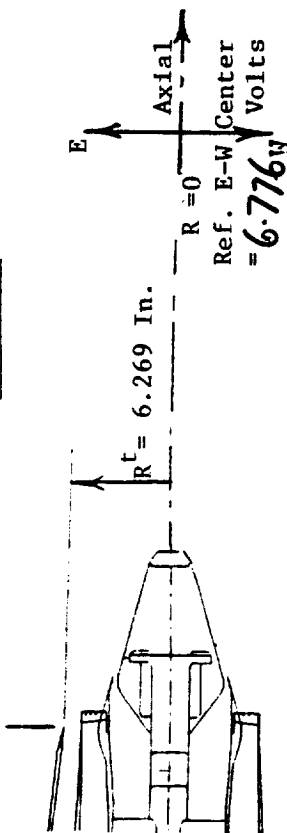
Matching

Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$
  
= 5.514 In.

$v^{mix} = 2010$  fps  
 $v^0 = 2338$  fps  
 $v^1 = 1510$  fps  
 $v^s = 1497$  fps  
 $v_{ac} = 0$  fps



Graph Number		Pen	Mini	Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments
						Volts		Inches		Normalized		Feet/Sec.		
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'	V̄/V <sup>mix</sup>	V'/V <sup>mix</sup>	
115				2.450	7.010	4.417	0.776	8.01	0.124	1591	138	0.792	0.069	EAST
					6.559		0.720		0.115	1462	122	0.727	0.066	WEST
					6.155		2.060		0.329	1415	129	0.704	0.064	
					5.749		3.406		0.543	1298	184	0.646	0.092	
117	118		E-W	2.143	-	22.09	-	4.01	-	-	-	-	-	-
					8.060		4.259		0.679	1163	251	0.579	0.125	EAST
					7.695		3.058		0.488	1980	149	0.985	0.074	
					7.465		2.285		0.365	1824	144	0.908	0.072	
					7.158		1.267		0.202	1455	168	0.724	0.084	
					6.872		0.153		0.024	1358	137	0.676	0.068	

Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836, Volts

Configuration: TAS-16

LV Test Point: 3

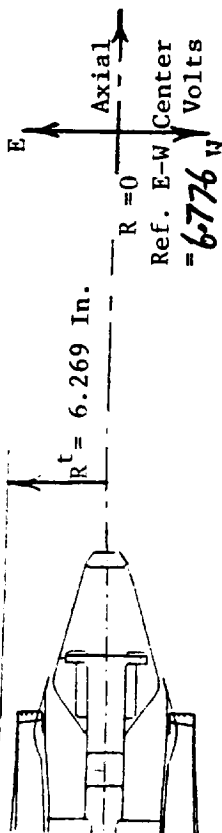
Matching

Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.



$v^{mix} =$  2010 fps  
 $v^0 =$  2338 fps  
 $v^1 =$  1510 fps  
 $v^s =$  1497 fps  
 $v_{ac} =$  0 fps

Graph Number		Pen	Mtn1	Traverse Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
						Volts		Inches		Normalized		Feet/Sec.				
						Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'		V̄/V <sup>mix</sup>	V'/V <sup>mix</sup>
117					040	2.143	6.449	22.09	0.919	4.01	0.147	1299	67	0.646	0.033	WEST
					041		6.206		1.891		0.302	1426	127	0.71	0.063	
					042		5.935		2.790		0.445	1587	141	0.79	0.07	
					043		5.634		3.788		0.604	Insufficient	Samples			
					044		6.015		2.524		0.403	1596	137	0.794	0.068	✓
119	120			E-W	-	2.066	-	16.55	-	3.00	-	-	-	-	-	-
					045		5.788		3.277		0.523	1449	215	0.721	0.107	WEST
					046		5.979		2.644		0.422	1667	163	0.83	0.081	
					047		6.155		2.060		0.329	1511	157	0.752	0.078	
					048		6.348		1.420		0.226	1269	94	0.631	0.047	✓

Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836 , Volts

Configuration: TAS-16

LV Test Point: 3

Matching

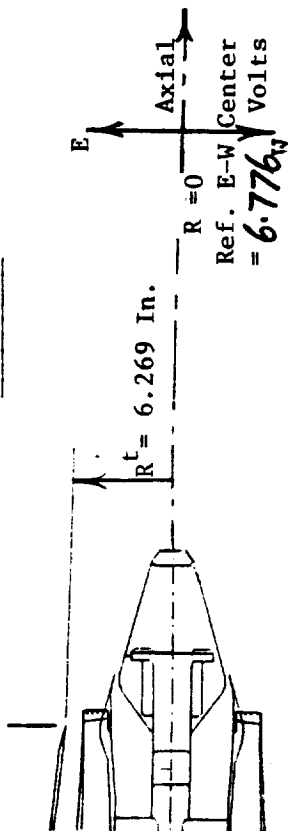
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} =$  2010 fps  
 $V^0 =$  2338 fps  
 $V^1 =$  1510 fps  
 $V^8 =$  1497 fps  
 $V_{ac} =$  0 fps



Graph Number		Location (X and R)				Velocity (V and V')				Comments		
		Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini	Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'	V̄/V <sup>mix</sup>	V'/V <sup>mix</sup>	
119		2.066	6.480	16.55	0.982	3.00	0.157	1254	73	0.624	0.036	WEST
			6.690		0.285		0.046	1191	108	0.593	0.054	↓
			7.098		1.068		0.170	1411	141	0.70	0.07	EAST
			7.488		2.362		0.377	1786	122	0.889	0.061	
			7.726		3.151		0.503	2025	125	1.001	0.062	
			7.986		4.013	↓	0.640	1393	215	0.693	0.107	↓
121	122	1.990	-	11.08	-	2.01	-	-	-	-	-	-
			8.274		4.969		0.793	922	193	0.459	0.096	EAST
			8.127		4.481		0.715	1235	185	0.614	0.092	
			7.969		3.957	↓	0.631	1572	180	0.782	0.09	↓



Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836 , Volts

Configuration: TAS-16

LV Test Point: 3

Matching

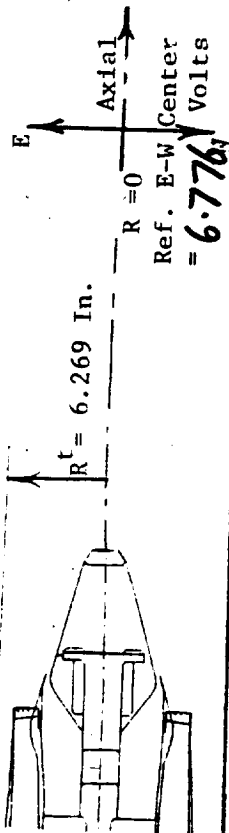
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} = 2010$  fps  
 $V^0 = 2338$  fps  
 $V^1 = 1510$  fps  
 $V^S = 1497$  fps  
 $V_{ac} = 0$  fps



6.1/10.1 volts

Graph Number		Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments
				Volts		Inches		Normalized		Feet/Sec.		
Pen	Mini	Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
121		1.990	7.863	11.08	3.605	2.01	0.575	Insufficient Samples				EAST
			7.757		3.254		0.519	2042	135	1.016	0.067	
			7.603		2.743		0.438	1771	147	0.881	0.073	
			7.447		2.226		0.355	1599	136	0.796	0.068	
			7.245		1.556		0.248	1459	76	0.726	0.038	WEST
			6.312		1.539		0.246	1286	85	0.64	0.042	
			6.222		1.837		0.293	1222	107	0.608	0.053	
			6.134		2.130		0.340	1223	114	0.609	0.057	
			6.027		2.484		0.396	1442	187	0.717	0.093	
			5.897		2.915		0.465	1873	216	0.932	0.108	

Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836 , Volts

Configuration: TAS-16

LV Test Point: 3

Matching

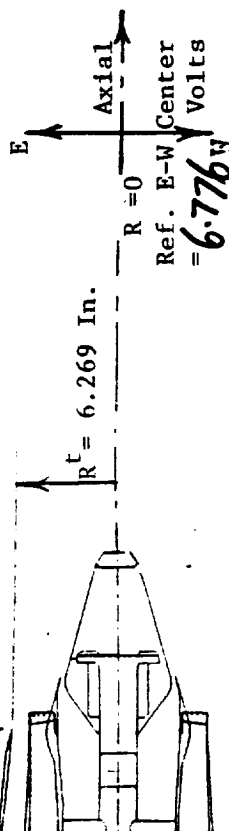
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.514 \text{ In.}$$

$V^{mix} = \underline{2010}$  fps  
 $V^0 = \underline{2338}$  fps  
 $V^1 = \underline{1510}$  fps  
 $V^8 = \underline{1497}$  fps  
 $V_{ac} = \underline{0}$  fps



Graph Number		Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
Pen	Mini		Volts		Inches		Normalized		Feet/Sec.				
			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	$V'/V^{mix}$
121		068	1.990	5.705	11.08	3.552	2.01	0.567	1769	285	0.880	0.142	WEST
↓		069	↓	5.483	↓	4.289	↓	0.684	1058	267	0.526	0.133	↓
123	124	-	1.951	-	8.27	-	1.50	-	-	-	-	-	-
125	126	-	1.913	-	5.54	-	1.00	-	-	-	-	-	-
		070		5.377		4.640		0.740	Insufficient	Samples			WEST
		071		5.597		3.910		0.624	2307	154	1.148	0.077	
		072		5.725		3.486		0.556	2185	189	1.087	0.094	
		073		5.848		3.078		0.491	1398	301	0.696	0.15	
		074		5.891		2.935		0.468	1341	129	0.667	0.064	↓
↓		075	↓	7.676	↓	2.985	↓	0.476	1334	53	0.664	0.026	EAST

Table 5-IV. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.836 , Volts

Configuration: TAS-16

LV Test Point: 3

Matching

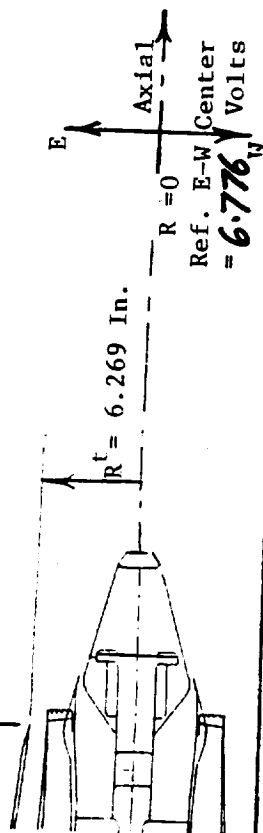
Acoustic

Test Point: 1639

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} =$  2010 fps  
 $V^0 =$  2338 fps  
 $V^1 =$  1510 fps  
 $V^S =$  1497 fps  
 $V_{ac} =$  0 fps



0.110 V

Graph Number		Pen	Mini	Traverse Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments
						Volts		Inches		Normalized		Feet/Sec.		
		Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'	V̄/V <sup>mix</sup>	V'/V <sup>mix</sup>			
125		1.913	7.751	5.54	3.234	1.00	0.516	1494	177	0.743	0.088			
			7.836		3.516		0.561	1604	248	0.798	0.123			
			7.836		3.516		0.561	1599	228	0.796	0.113			
			7.891		3.698		0.590	1990	213	0.99	0.106			
			8.007		4.083		0.651	2075	152	1.032	0.076			
			8.144		4.537		0.724	2094	198	1.042	0.099			
			8.202		4.730		0.755	1519	119	0.756	0.059			
			8.308		5.081		0.811	1419	111	0.706	0.055			
			8.415		5.436		0.867	1068	209	0.531	0.104			

**= 5.514 In.**

Diagram of the electron gun assembly. The distance from the cathode to the anode is labeled  $R^t = 6.269$  In. The axial direction is indicated by an arrow labeled "Axial" and "E". The reference E-W center is marked with "R = 0" and "Volts = 6.776 V".

$v_{mix} =$	<u>2010</u>	fps
$v^0 =$	<u>2338</u>	fps
$v^1 =$	<u>1510</u>	fps
$v^8 =$	<u>1497</u>	fps
$v_{ac} =$	<u>0</u>	fps

Graph Number			Traverse Type (X-Y-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
Pen	Mini	Volts			Inches		Normalized		Feet/Sec.		Normalized				
		Axial			E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	V̄	V'	V̄/V <sup>mix</sup>		V'/V <sup>mix</sup>	
127	128	E-W	-	1.874	-	2.73	-	0.50	-	-	-	-	-	-	
			085		7.995		4.043			0.645	2.514	130	1.251	0.065	EAST
			086		8.090		4.358			0.695	2.392	275	1.190	0.137	
			087		8.163		4.600			0.734	2.411	289	1.20	0.144	
			088		8.277		4.978			0.794	2.363	183	1.176	0.091	
			089		8.343		5.197			0.829	1.833	209	0.912	0.104	
			090		8.422		5.459			0.871	1.532	63	0.762	0.031	
			091		8.528		5.811			0.927	1.460	101	0.726	0.050	
			092		8.557		5.907			0.942	1.380	146	0.687	0.073	✓
✓			093	✓	5.287	✓	4.939	✓		0.788	2.219	173	1.104	0.086	WEST



DATE: June 1, 83 NOZZLE: TAS-16

TEST POINT: L.V. -3 ; ACOUSTIC - 1639

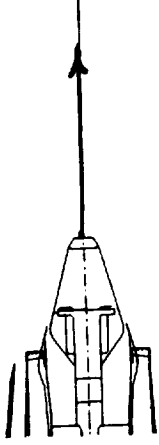
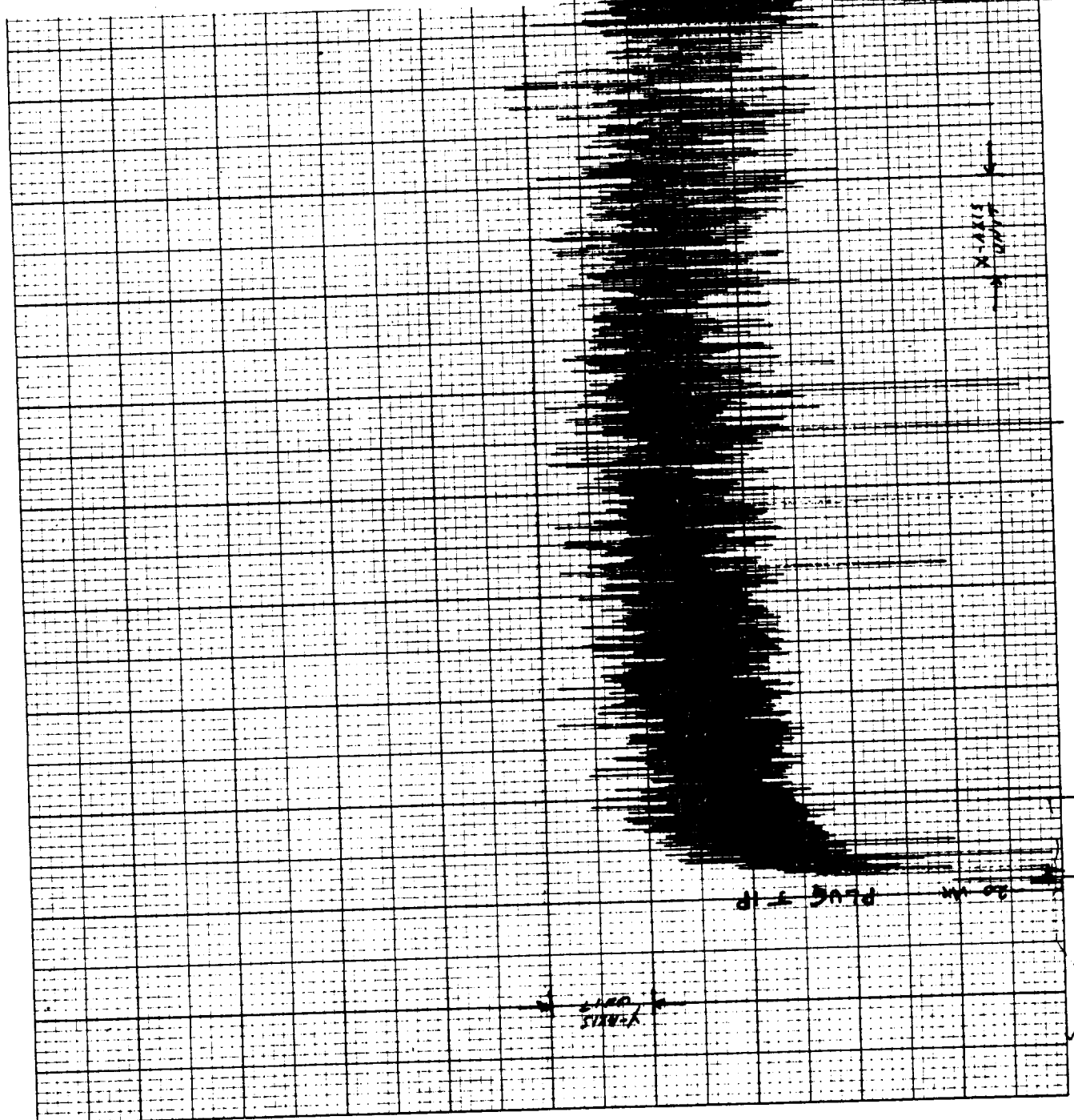
PLOT IDENTIFICATION: 6-101

TRAVERSE DETAILS:

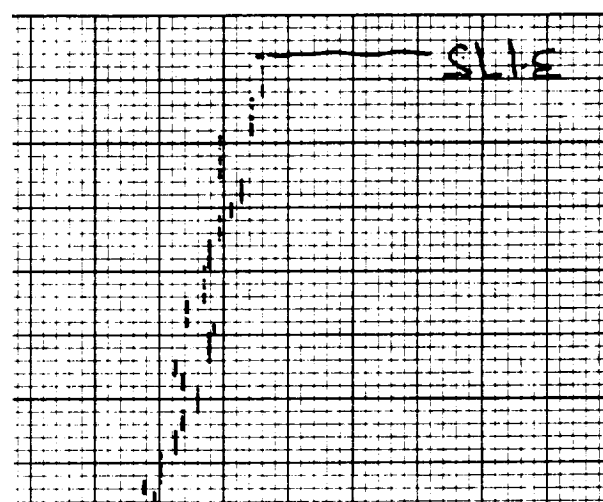
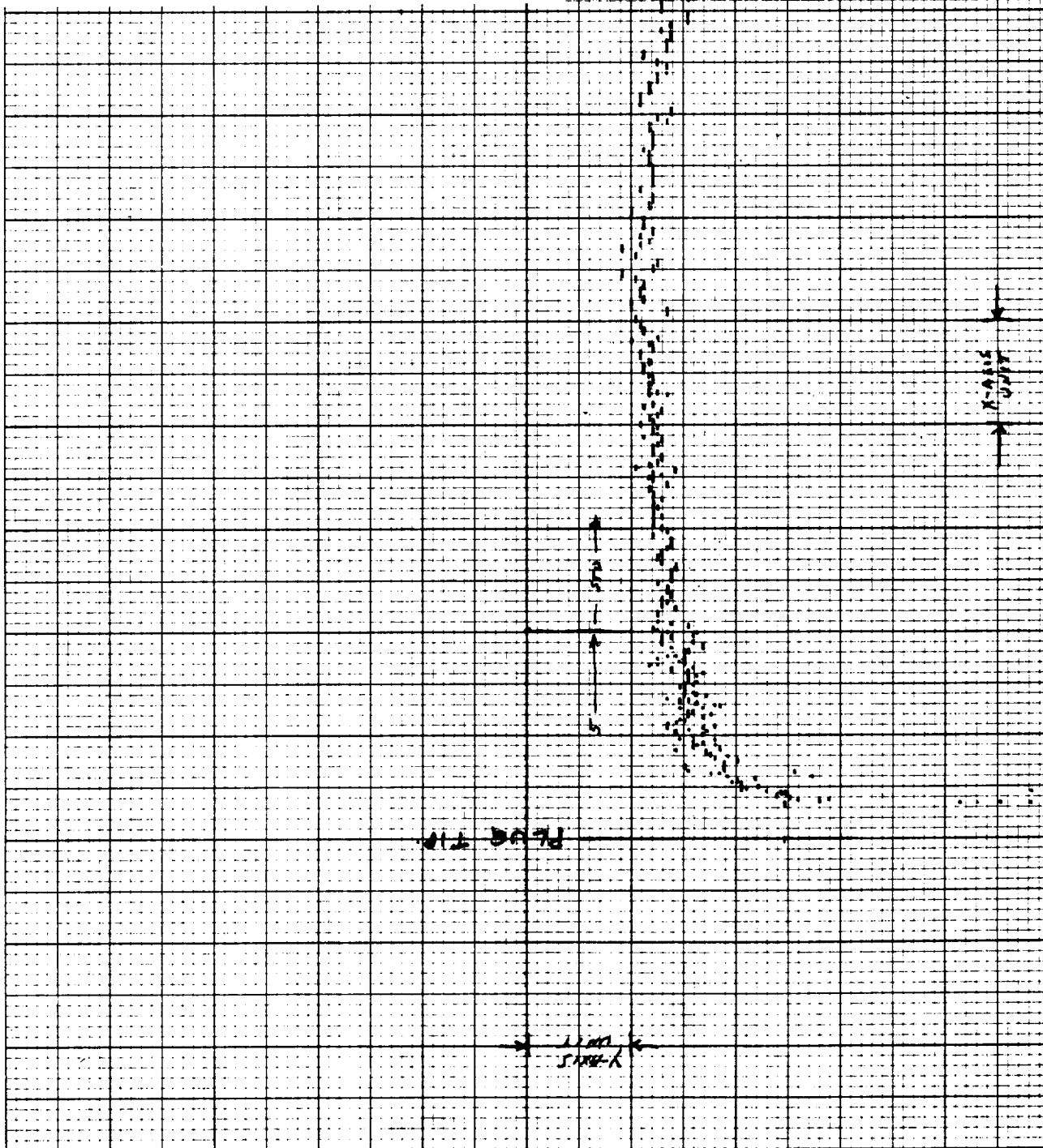
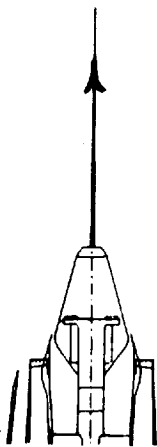
AXIAL ☒ : ☒ : OFFSET - ☐  
 RADIAL REF. (C) - 6.811 VOLTS  $R = 60$   
 LOCATIONS: TRAVERSE - 6.811 VOLTS  $R_2$   
 RADIAL ☐ : E.W. - ☐ ; N.S. - ☐  
 AXIAL REF. ( ) - VOLTS  $X =$   
 LOCATIONS: TRAVERSE - VOLTS  $D_{eq}$

SCALE: X-AXIS = 720 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT

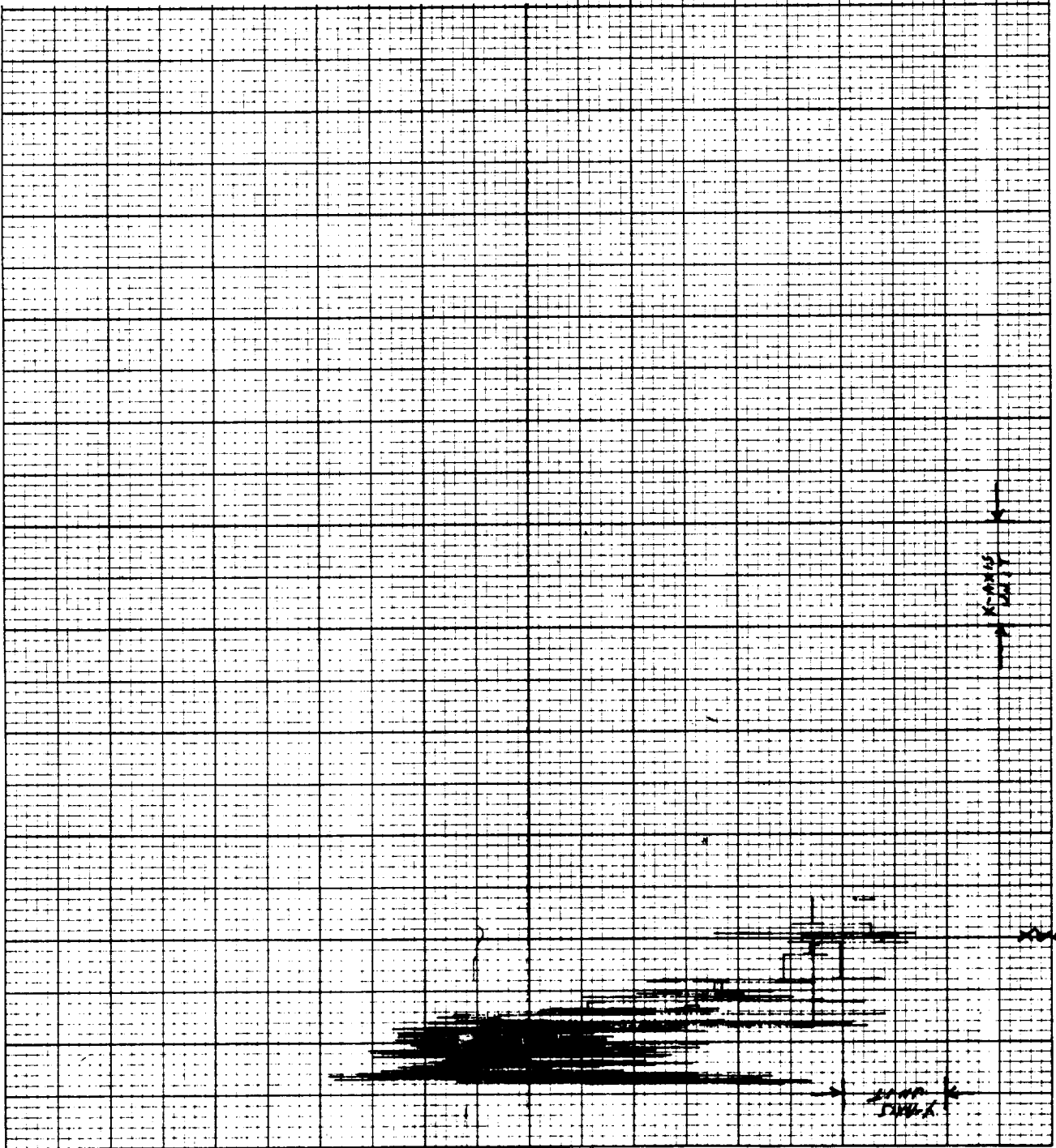
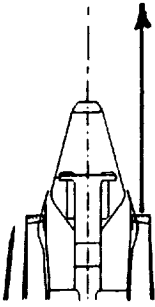
HISTOGRAMS: H - TO H -

DATE: 6/1/83	NOZZLE: TAs-16
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-103	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> ; <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	
RADIAL REF. (C) - 6.811 VOLTS R	
LOCATIONS: TRAVERSE - 6.811 VOLTS R	
RADIAL <input type="checkbox"/> ; E.M. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS X	
LOCATIONS: TRAVERSE - VOLTS D <sub>eq</sub>	
SCALE: X-AXIS= 7.2 D INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H- 1	



DATE: 6/1/83	NOZZLE: TAS-16
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-104	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - $\square$ ; OFFSET - 10	
RADIAL REF. ( $\phi$ ) - 6.811 VOLTS $R_2$ - 746	
LOCATIONS: TRAVERSE - 5.403 VOLTS $R_2$	
RADIAL $\square$ : E.W. - $\square$ ; N.S. - $\square$	
AXIAL REF. ( ) - VOLTS $X =$	
LOCATIONS: TRAVERSE - VOLTS $D_{eq}$	
SCALE : X-AXIS= 7.20 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	





DATE: 6/1/83 NOZZLE: JAS-16

TEST POINT: L.V. - 3 ; ACOUSTIC - 1639

PLOT IDENTIFICATION: G-105

TRAVERSE DETAILS:

AXIAL ☒ : ☐ ; OFFSET - ☒

RADIAL REF. ( ☒ ) - 6.811 VOLTS  $R_2$  - 746

LOCATIONS: TRAVERSE - 5.403 VOLTS  $R_2$

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

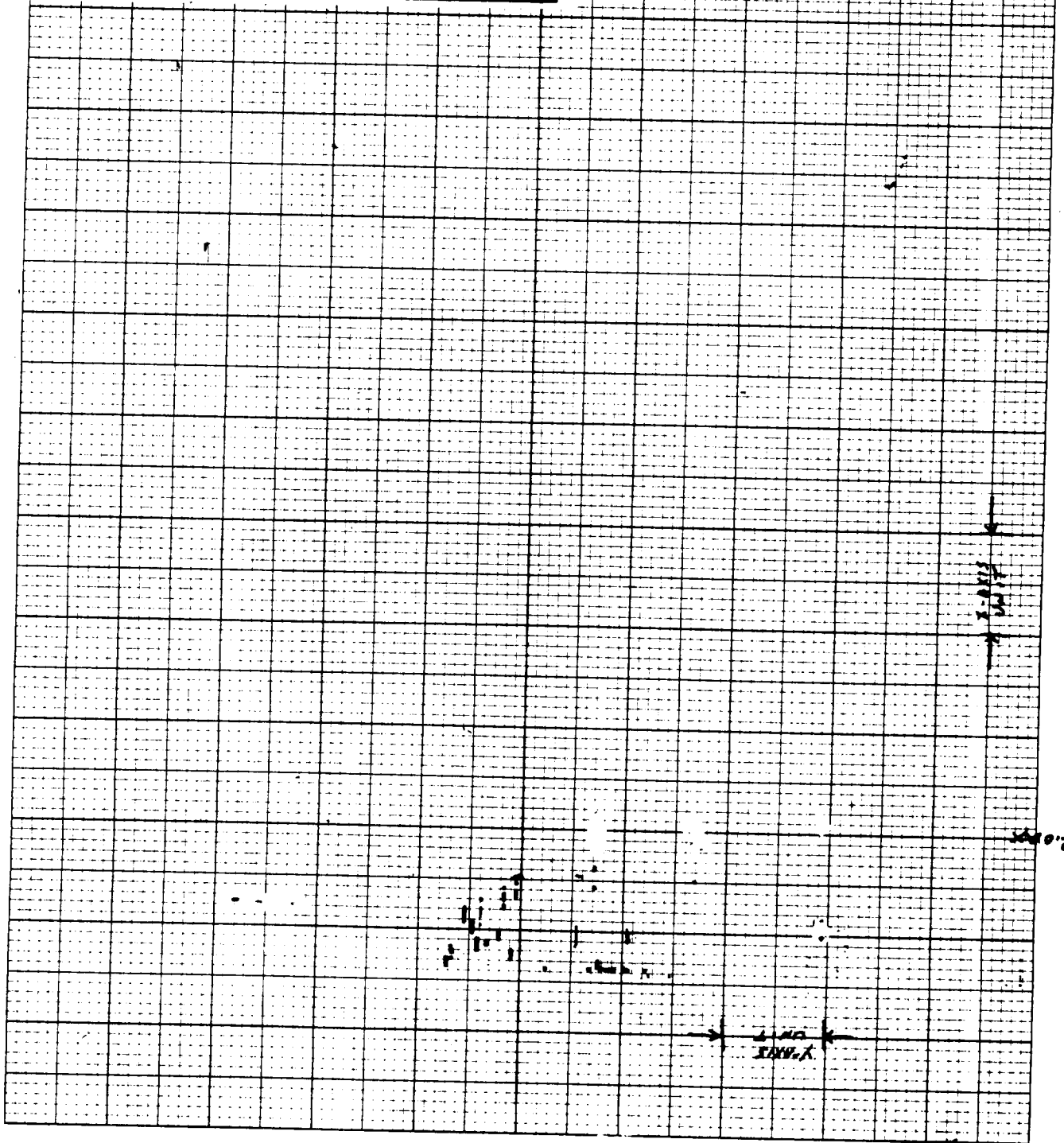
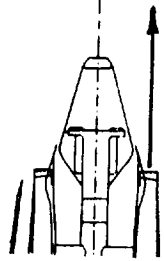
AXIAL REF. ( ☐ ) - VOLTS  $X =$

LOCATIONS: TRAVERSE - VOLTS  $D_{eq}$

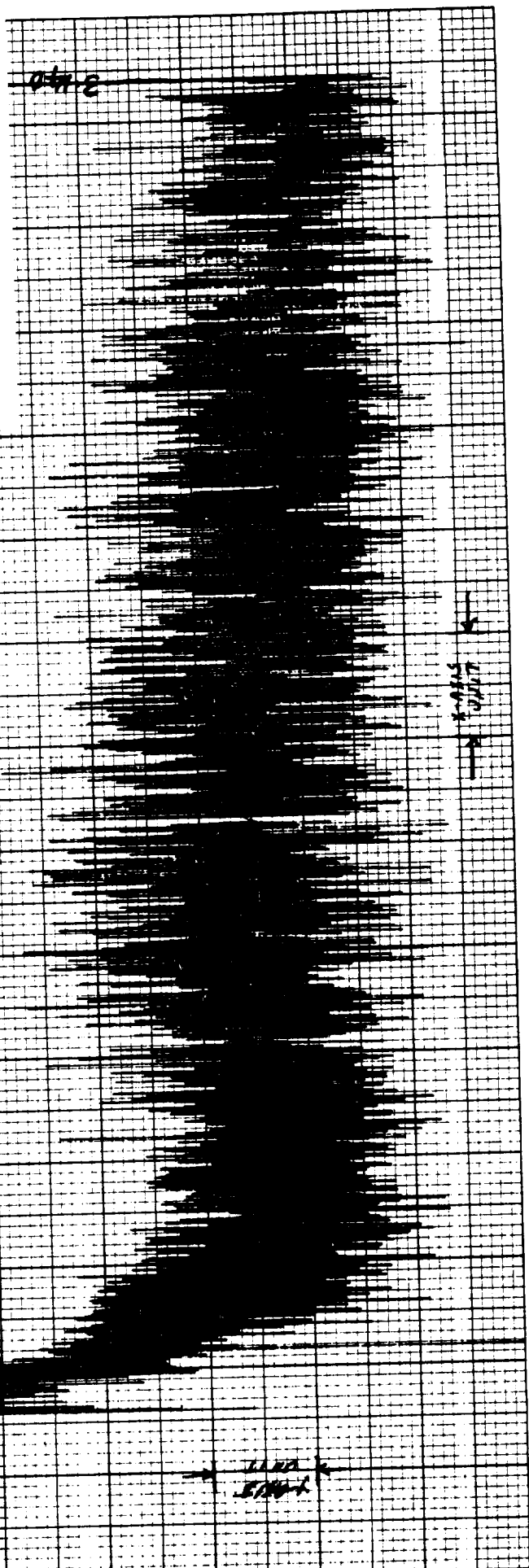
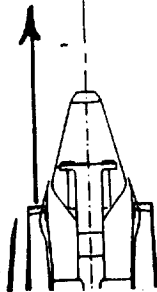
SCALE: X-AXIS = 7.20 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

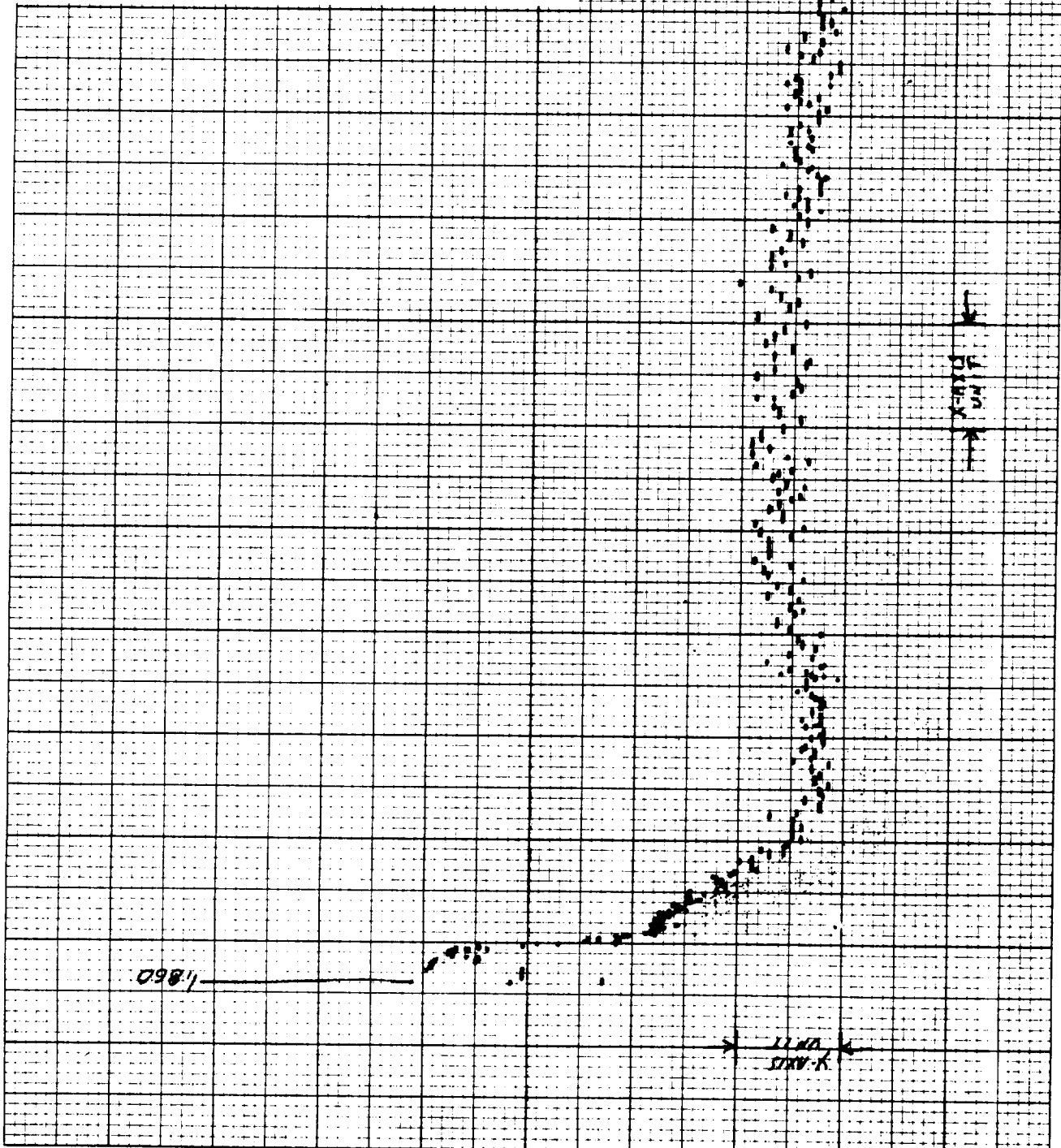
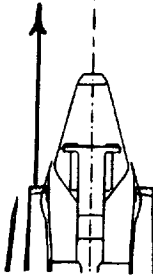
HISTOGRAMS: H- TO H-



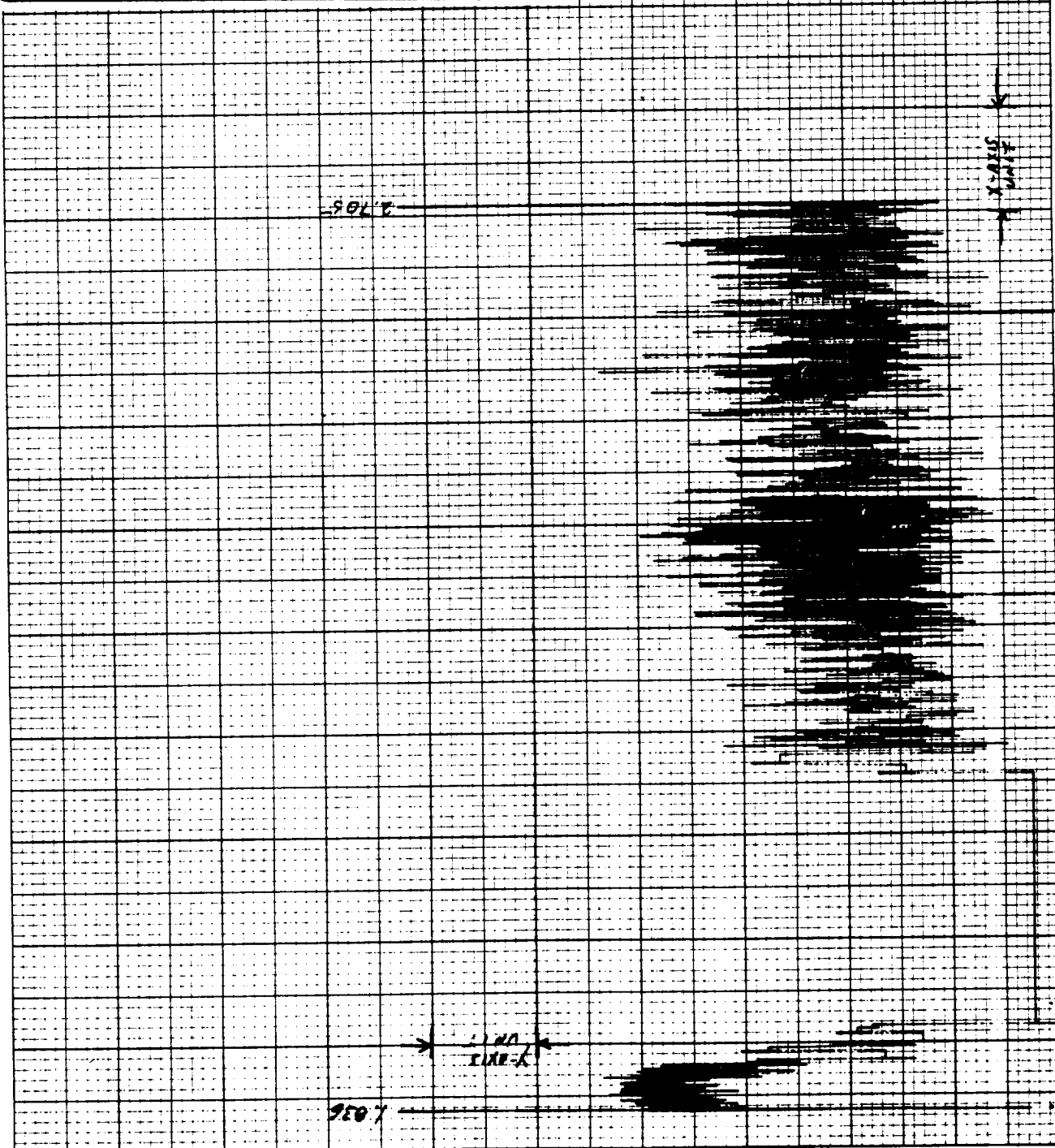
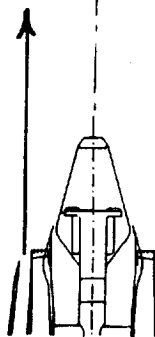
DATE: 6/1/83	NOZZLE: TAS-14
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-106	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - 24	
RADIAL REF. (C) - (6.81) VOLTS	R - 745
LOCATIONS: TRAVERSE - 8.219 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. (C) - VOLTS	X - 0
LOCATIONS: TRAVERSE - VOLTS	D <sub>eq</sub>
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



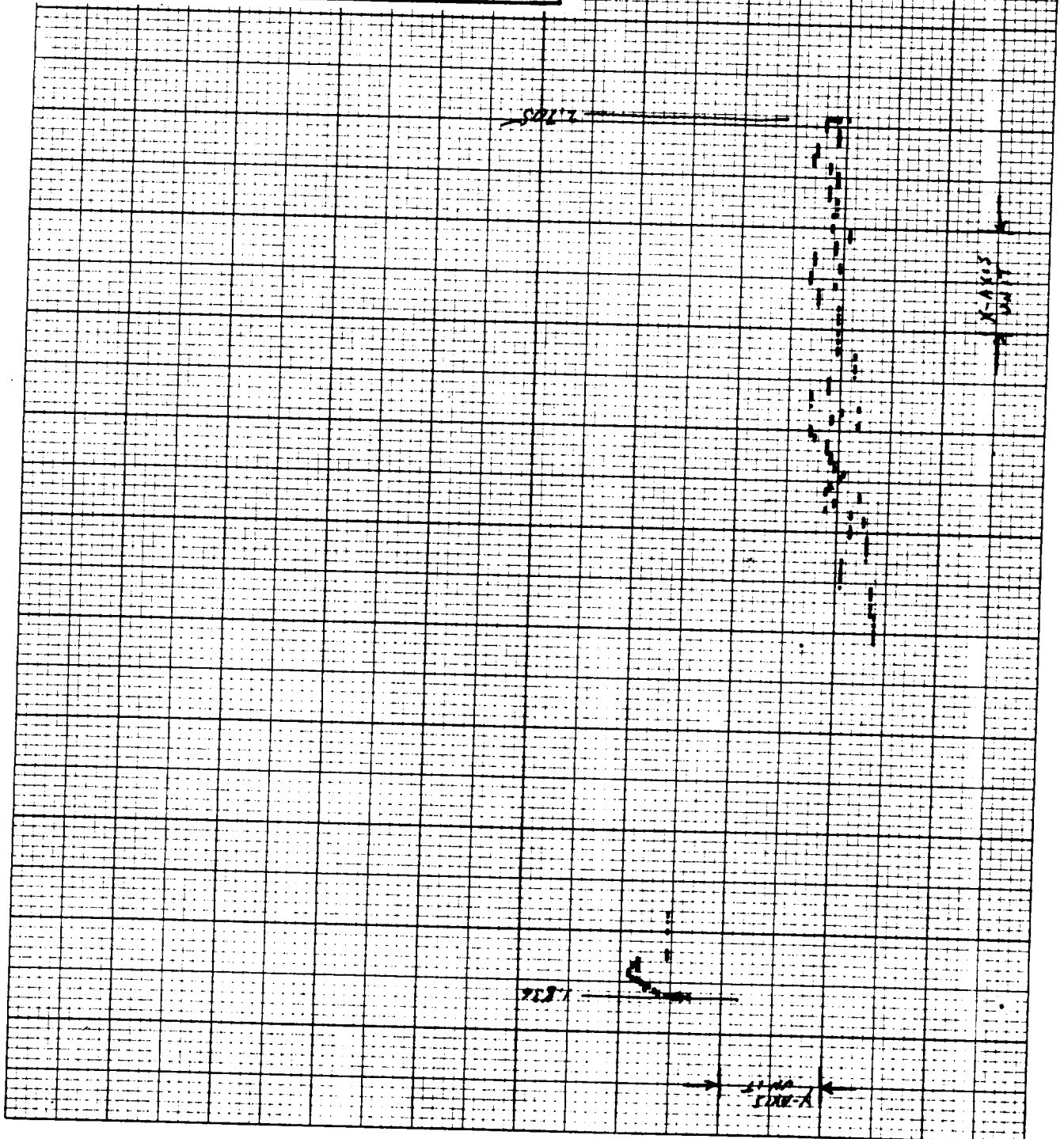
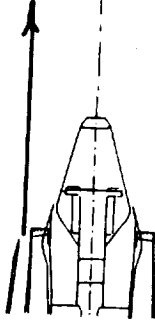
DATE: 6/1/83	NOZZLE: TAs-16
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-107	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. ( $\phi$ ) - 6.811 VOLTS	$R_2 = 7.46$
LOCATIONS: TRAVERSE - 8.219 VOLTS	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS	$X_{D_{eq}}$
LOCATIONS: TRAVERSE - VOLTS	
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



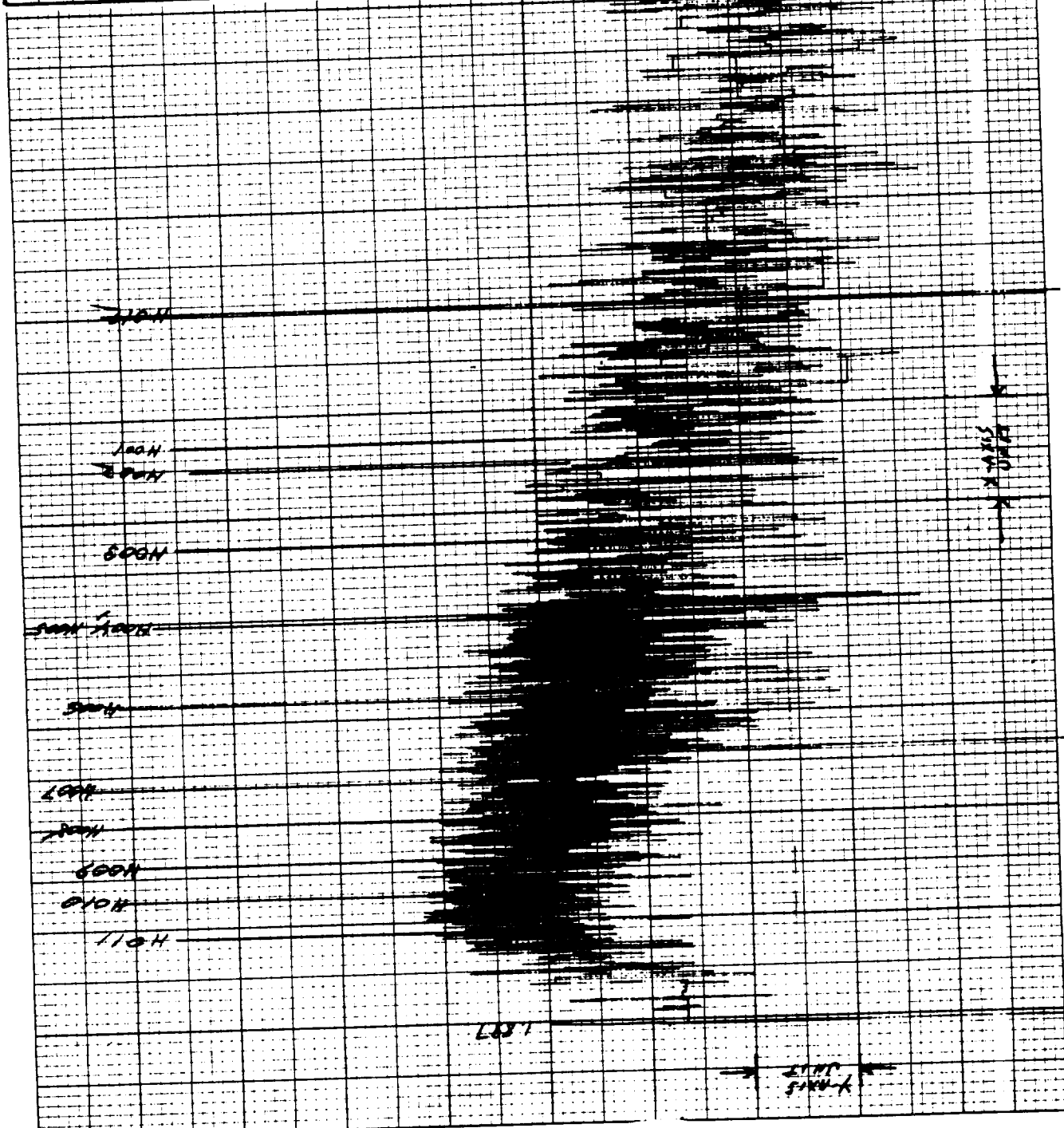
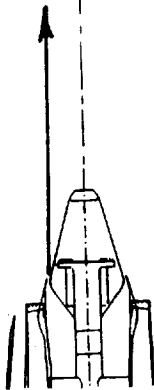
DATE: <b>6/1/83</b>	NOZZLE: <b>TAS-16</b>
TEST POINT: L.V. -	ACOUSTIC - <b>1639</b>
PLOT IDENTIFICATION: <b>G-108</b>	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> : OFFSET - <b>34</b>	
RADIAL REF. ( <input checked="" type="checkbox"/> ) - <b>6811</b> VOLTS) $R_2$ <b>93</b>	
LOCATIONS: TRAVERSE - <b>8544</b> VOLTS) $R_2$	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( <input type="checkbox"/> ) - VOLTS) $X_{eq}$	
LOCATIONS: TRAVERSE - VOLTS) $D_{eq}$	
SCALE: X-AXIS= <b>720</b> INCH/UNIT	
Y-AXIS= <b>390</b> F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



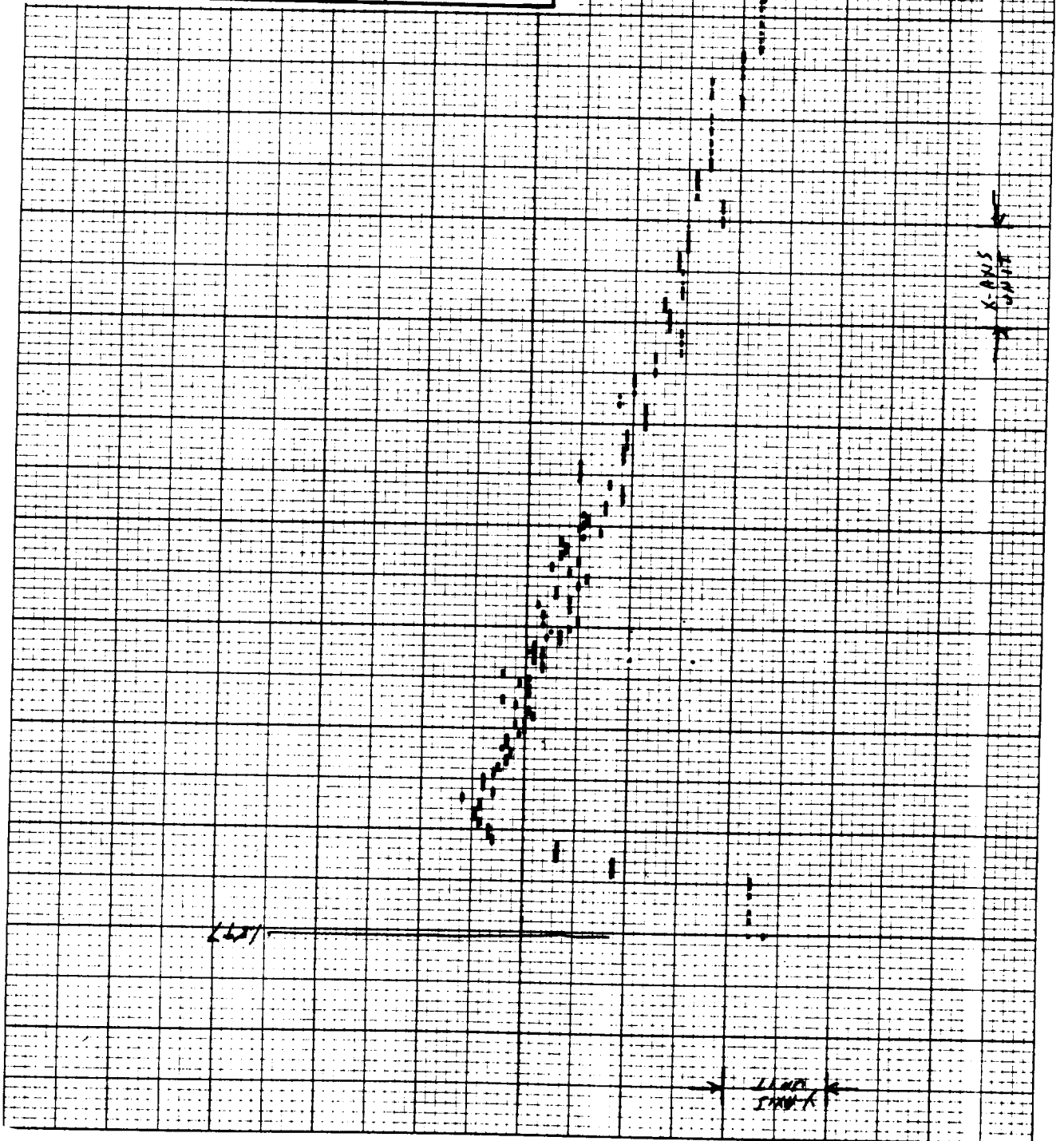
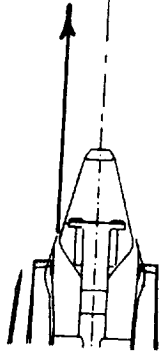
DATE: 6/1/63	NOZZLE: TAS-16
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-109	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : <input type="checkbox"/> ; OFFSET - A	
RADIAL REF. (C) - 6.811 VOLTS	R - 99
LOCATIONS: TRAVERSE - 8.564 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) -	VOLTS X
LOCATIONS: TRAVERSE -	VOLTS D <sub>eq</sub>
SCALE: X-AXIS= 7.20 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: 6/1/83	NOZZLE: TAS-16
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-110	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - <input checked="" type="checkbox"/>	RADIAL REF. (C) - 6.8V VOLTS $R_{-0.50}$
LOCATIONS: TRAVERSE - 7.752 VOLTS $R_2$	
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	AXIAL REF. ( ) - VOLTS $\frac{x}{D_{eq}}$
LOCATIONS: TRAVERSE -	
SCALE: X-AXIS = 7.20 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-001 TO H-012	

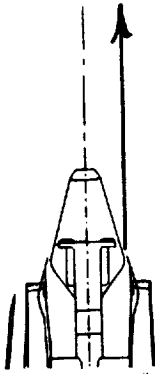


DATE: 6/1/83	NOZZLE: TAS-16
TEST POINT: L.V. - 3 ; ACOUSTIC - 1639	
PLOT IDENTIFICATION: G - 112	
TRAVERSE DETAILS	
AXIAL <input checked="" type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	RADIAL REF. (C) - 6.87 VOLTS $R_2$ - 50
LOCATIONS: TRAVERSE - 7.752 VOLTS $R_2$	
RADIAL <input type="checkbox"/> ; E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	AXIAL REF. ( ) - VOLTS $X_D$ -
LOCATIONS: TRAVERSE - VOLTS $D_{eq}$	
SCALE: X-AXIS = 7.20 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H- TO H-	





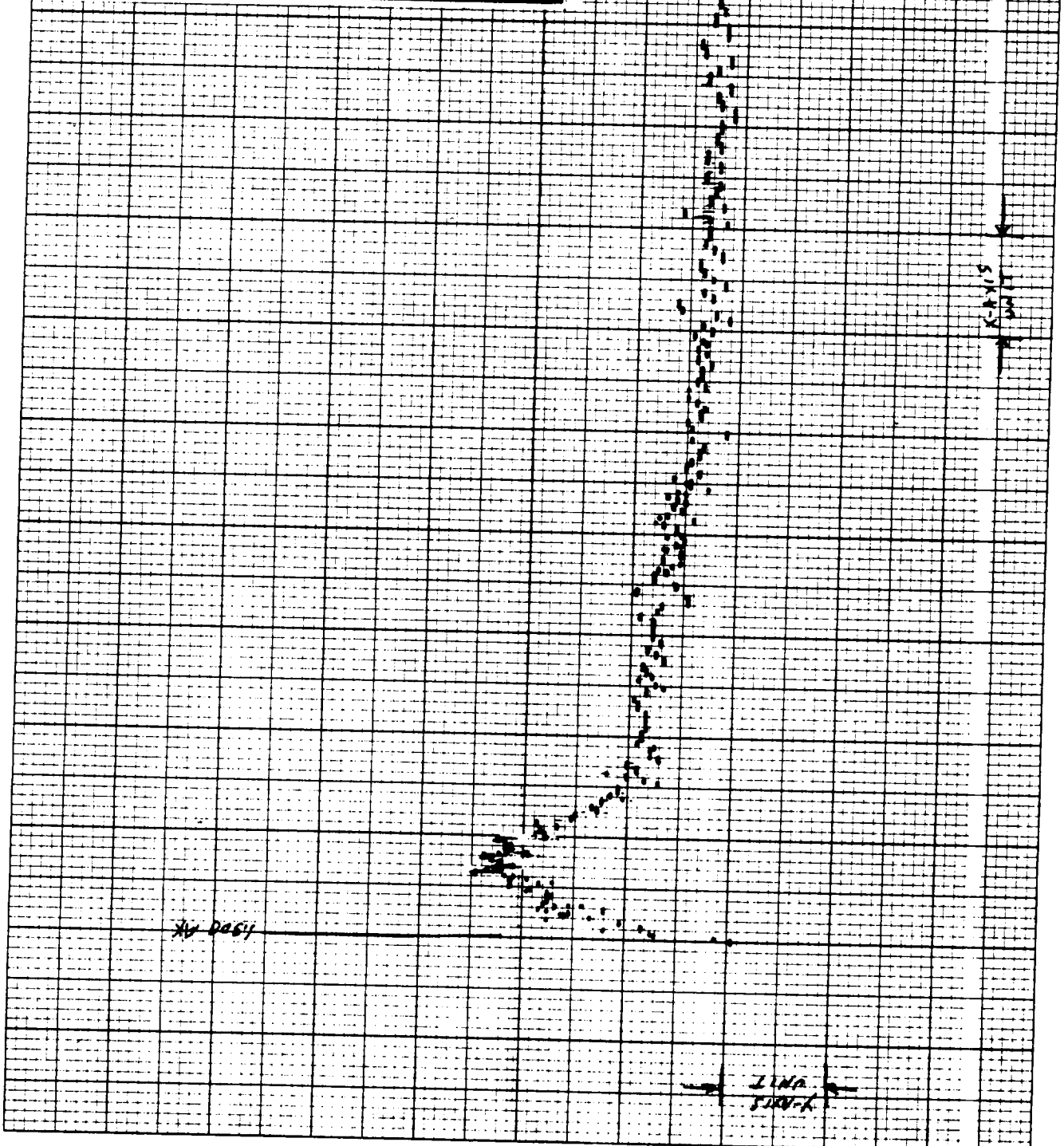
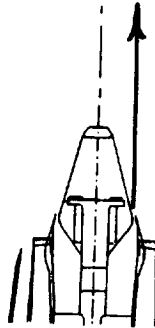
A diagram showing the front view of a vehicle chassis. A dashed vertical line represents the center of gravity, and a solid vertical line represents the steering axis. The vehicle body is shown with a central section and side sections.



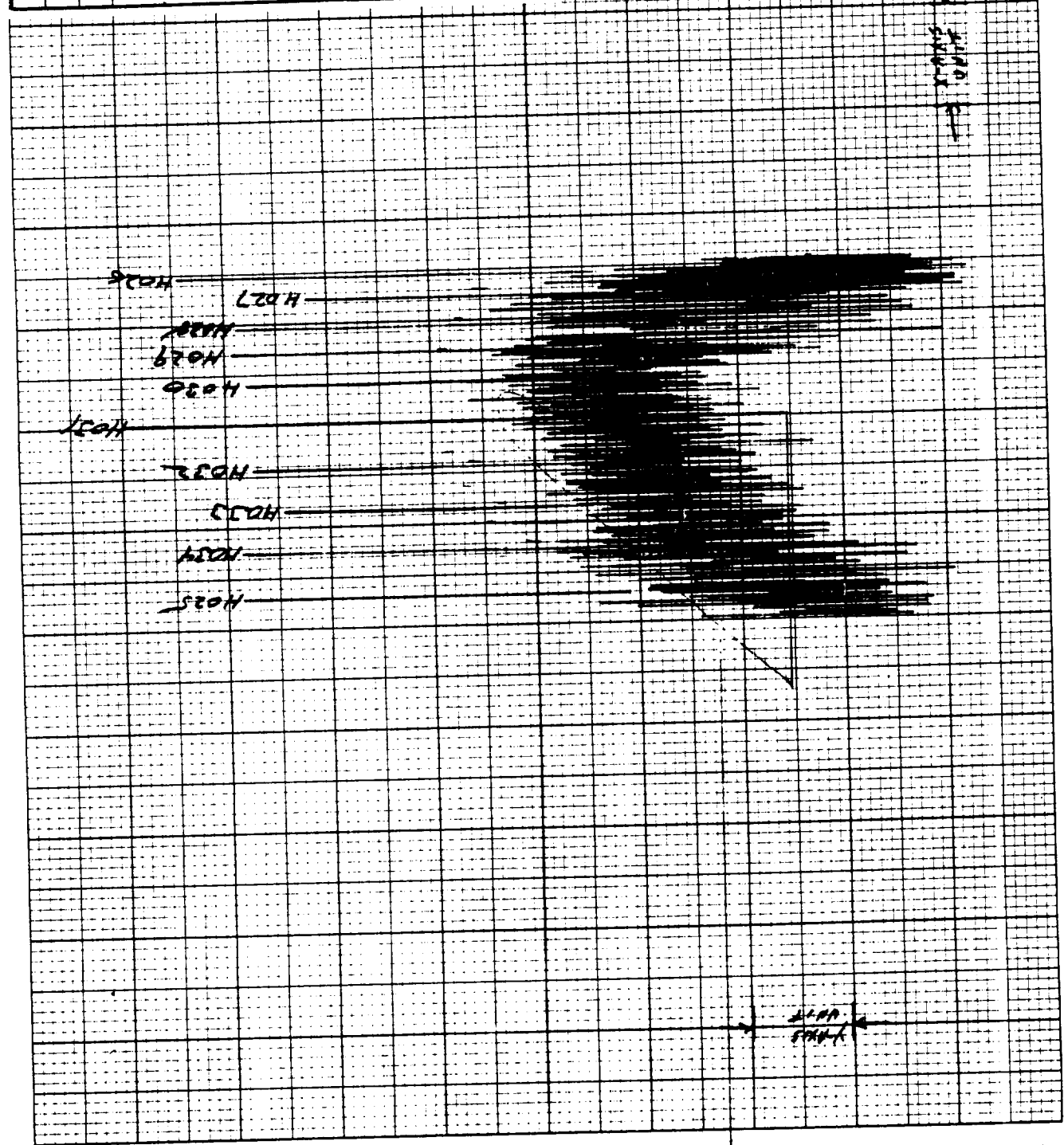
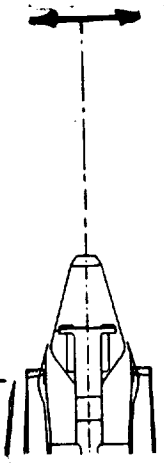


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DATE: 6/2/83	NOZZLE:
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-114	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - $\square$ ; OFFSET - $\infty$	
RADIAL REF. (C) - 6.776 VOLTS	R - 50
LOCATIONS: TRAVERSE - 5.822 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> : E.W. - $\square$ ; N.S. - $\square$	
AXIAL REF. ( ) -	VOLTS X
LOCATIONS: TRAVERSE -	VOLTS D
SCALE: X-AXIS= 720	INCH/UNIT
Y-AXIS= 390	F.P.S./UNIT
HISTOGRAMS: H- TO H-	



DATE: 6/2/83	NOZZLE: TAS-14
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-115	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - E	RADIAL REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE - VOLTS $R_2$	RADIAL $\times$ : E.W. - $\times$ : N.S. - <input type="checkbox"/>
AXIAL REF. $\times$ - 1836 VOLTS $X_{-80}$	LOCATIONS: TRAVERSE - 2450 VOLTS $D_{eq}$
SCALE: X-AXIS = 3.317 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-025 TO H-034	



DATE: 6/2/83 NOZZLE: TAS-16

TEST POINT: L.V. - 3 ; ACOUSTIC - 1639

PLOT IDENTIFICATION: G-116

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐

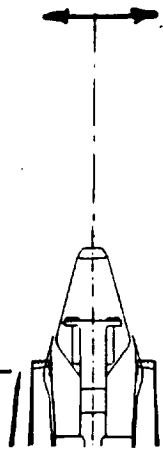
AXIAL REF. ( ) - 1.836 VOLTS X = 80

LOCATIONS: TRAVERSE - 2.450 VOLTS X<sub>Deq</sub>

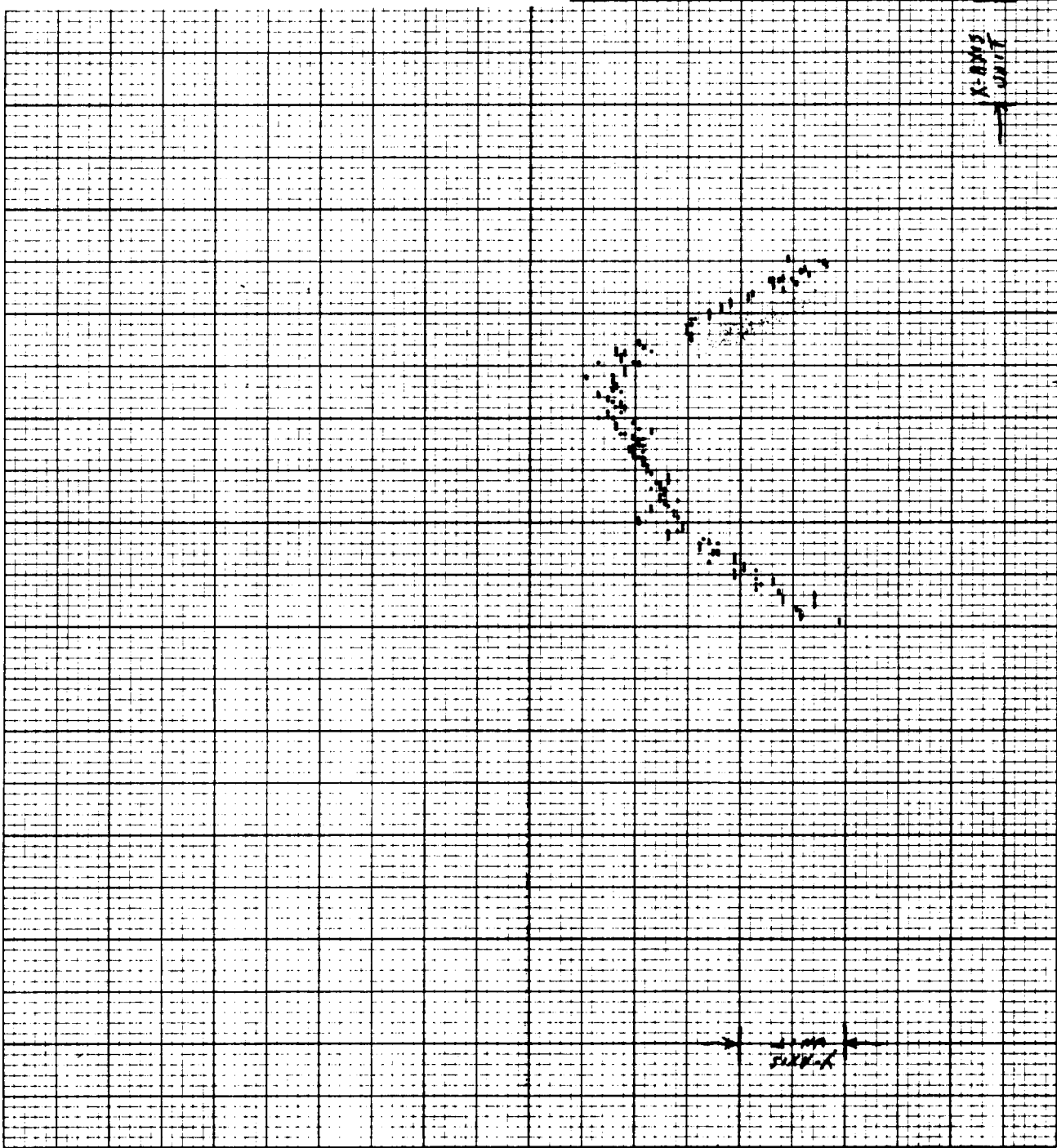
SCALE : X-AXIS= 3.317 INCH/UNIT

Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-



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OF POOR QUALITY



DATE: 6/2/83 NOZZLE: TAS-16

TEST POINT: L.V. - 3 ; ACOUSTIC - 1639

PLOT IDENTIFICATION: G - 117

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (N.S.) - 1836 VOLTS  $X = 4.0$

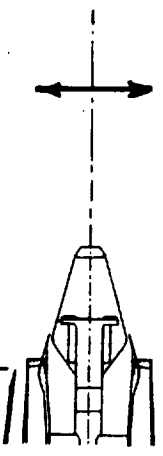
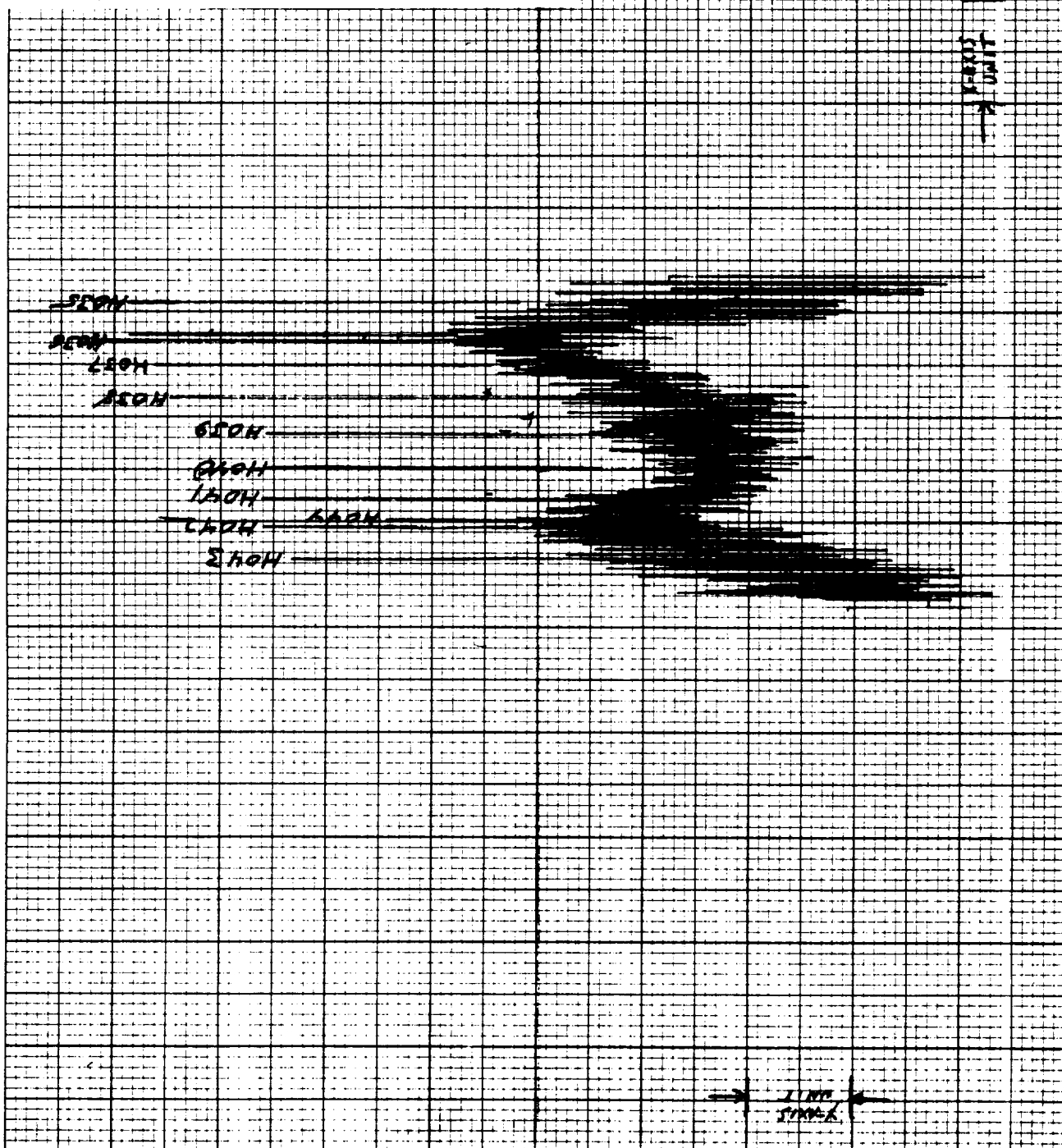
LOCATIONS: TRAVERSE - 2.143 VOLTS  $X_{deg}$

SCALE: X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-035 TO H-044

$X=0$

DATE: 6/2/83 NOZZLE: TAS-16  
 TEST POINT: L.V. - 3 ; ACOUSTIC - 1639  
 PLOT IDENTIFICATION: G-118

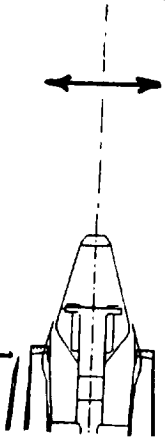
TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R<sub>1</sub>  
 LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>  
 RADIAL X : E.W. - ☒ ; N.S. - ☐  
 AXIAL REF. (X-0) - 1.826 VOLTS X<sub>D</sub>  
 LOCATIONS: TRAVERSE - 2.143 VOLTS D<sub>eq</sub>

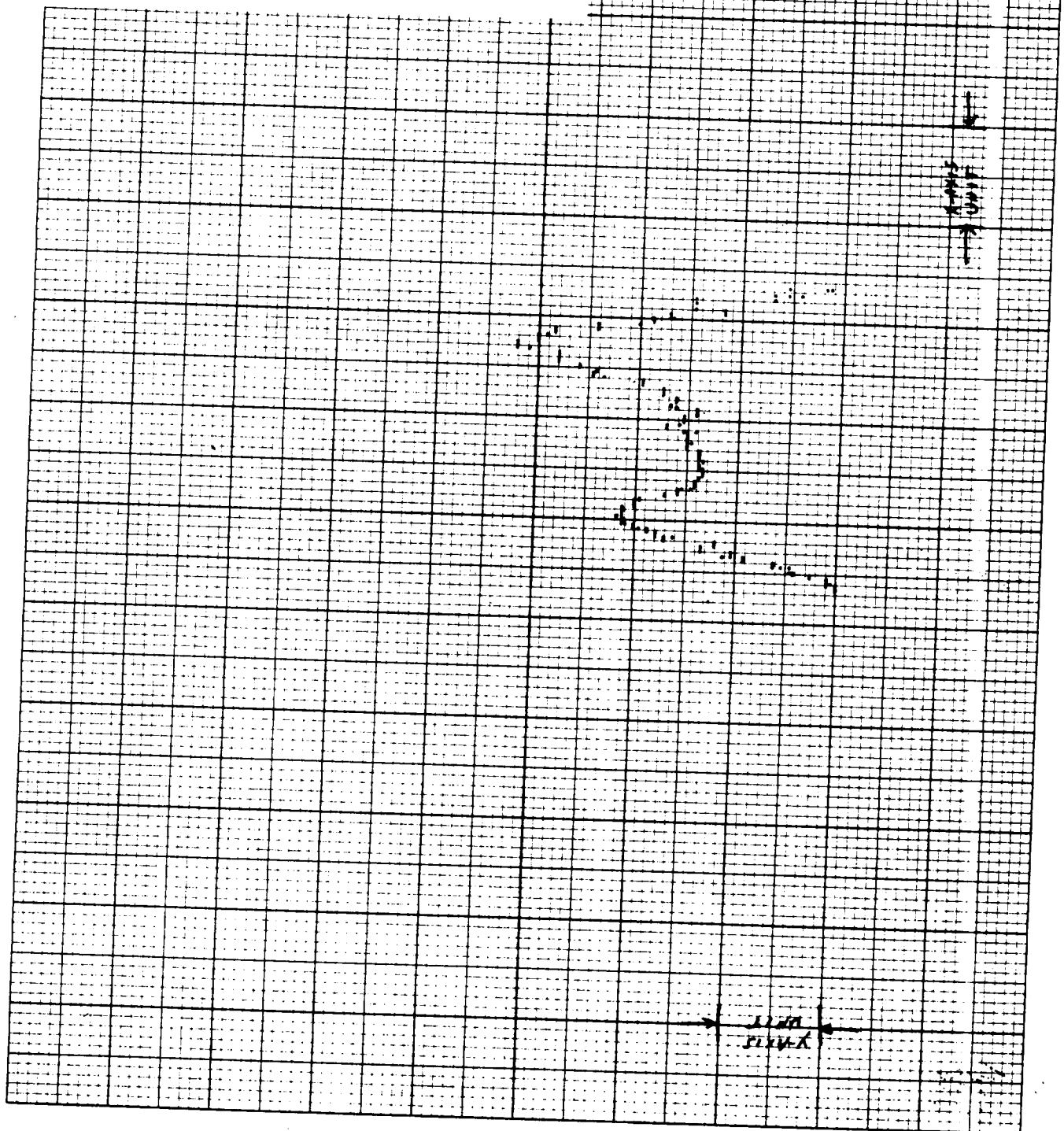
SCALE : X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

X=0



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 OF POOR QUALITY

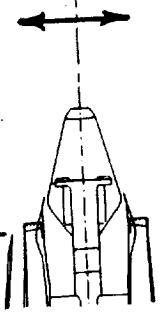
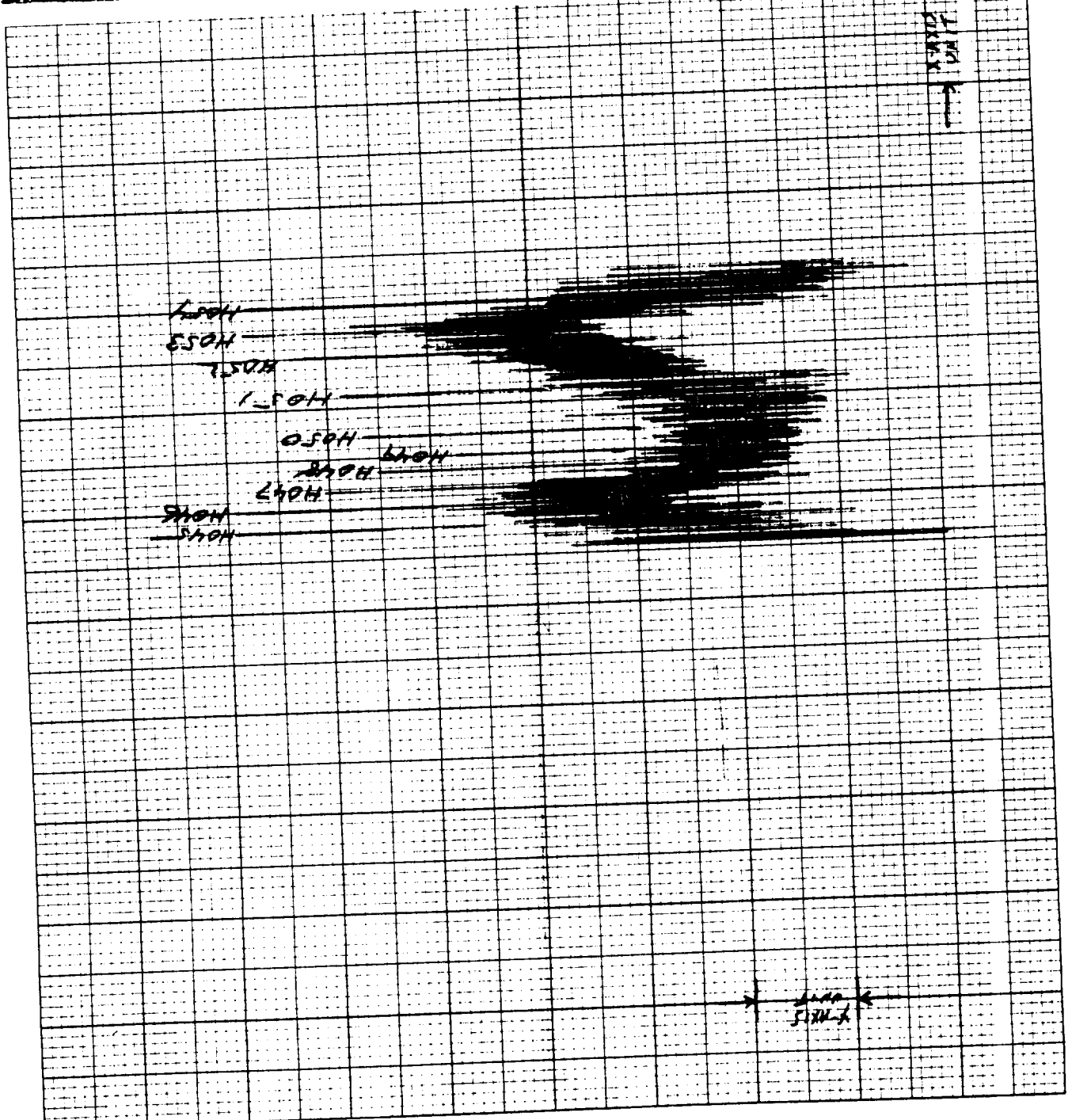


DATE: 6/2/83 NOZZLE: TAS-16  
 TEST POINT: L.V. - 3 ; ACOUSTIC - 1639  
 PLOT IDENTIFICATION: G-119

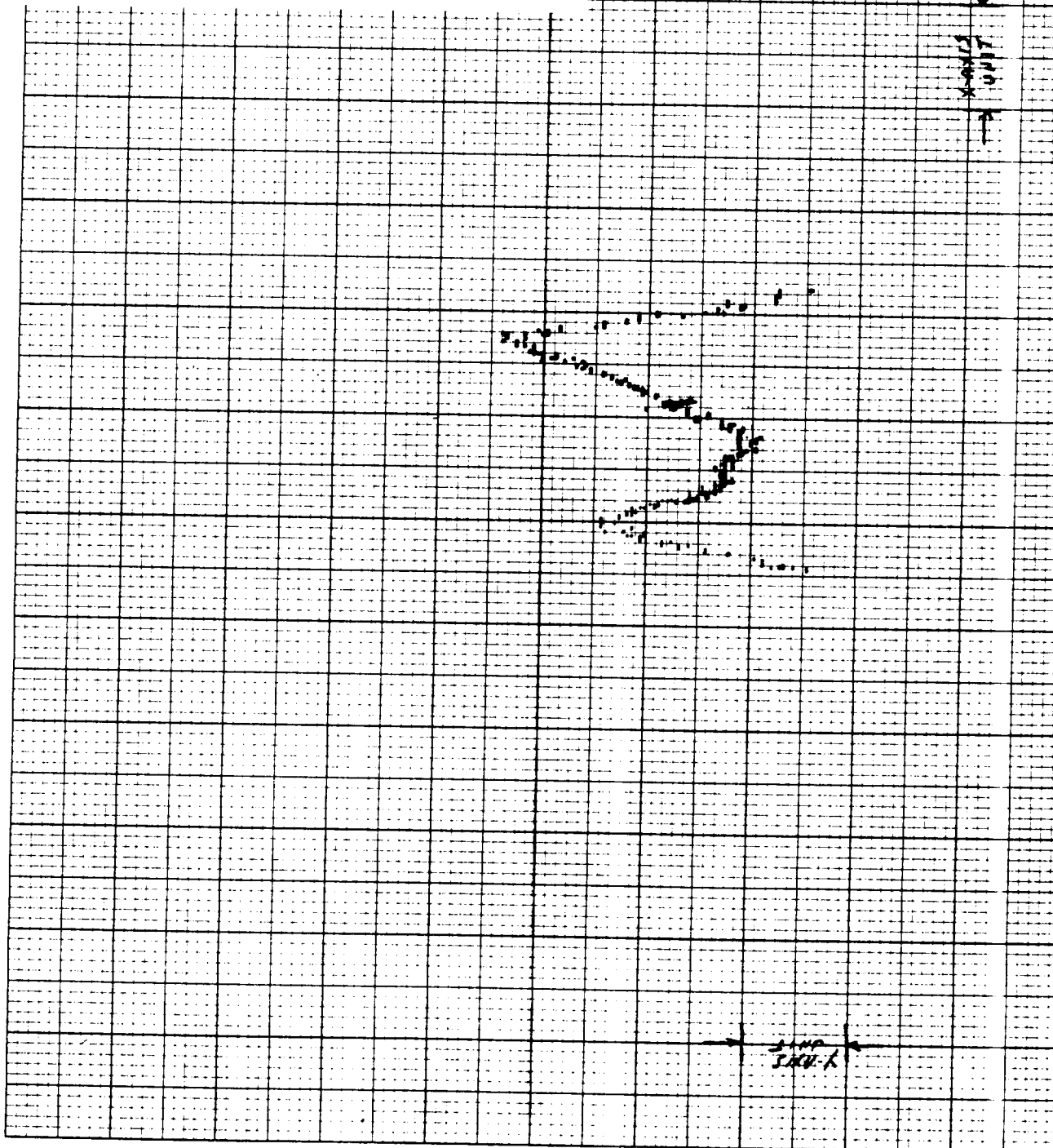
TRAVERSE DETAILS.  
 AXIAL ☐ : ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R =  
 LOCATIONS TRAVERSE - VOLTS R<sub>2</sub>  
 RADIAL X : E.W. - X ; N.S. - ☐  
 AXIAL REF. 000-1.836 VOLTS X = 300  
 LOCATIONS TRAVERSE - 2.066 VOLTS D<sub>eq</sub>

SCALE : X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-045 TO H-054  
 X=0





DATE: 6/2/83 NOZZLE: TAS-16

TEST POINT: L.V. - 3 ; ACOUSTIC - 1639

PLOT IDENTIFICATION: G-120

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET ☐

RADIAL REF. (  $\phi$  ) - VOLTS  $R_1$

LOCATIONS: TRAVERSE VOLTS  $R_2$

RADIAL  $\phi$  : E.W. -  $\phi$  ; N.S. - ☐

AXIAL REF. (  $\phi$  ) - VOLTS  $X = 3.00$

LOCATIONS: TRAVERSE - 2.066 VOLTS  $D_{eq} = 3.00$

SCALE: X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

$X=0$


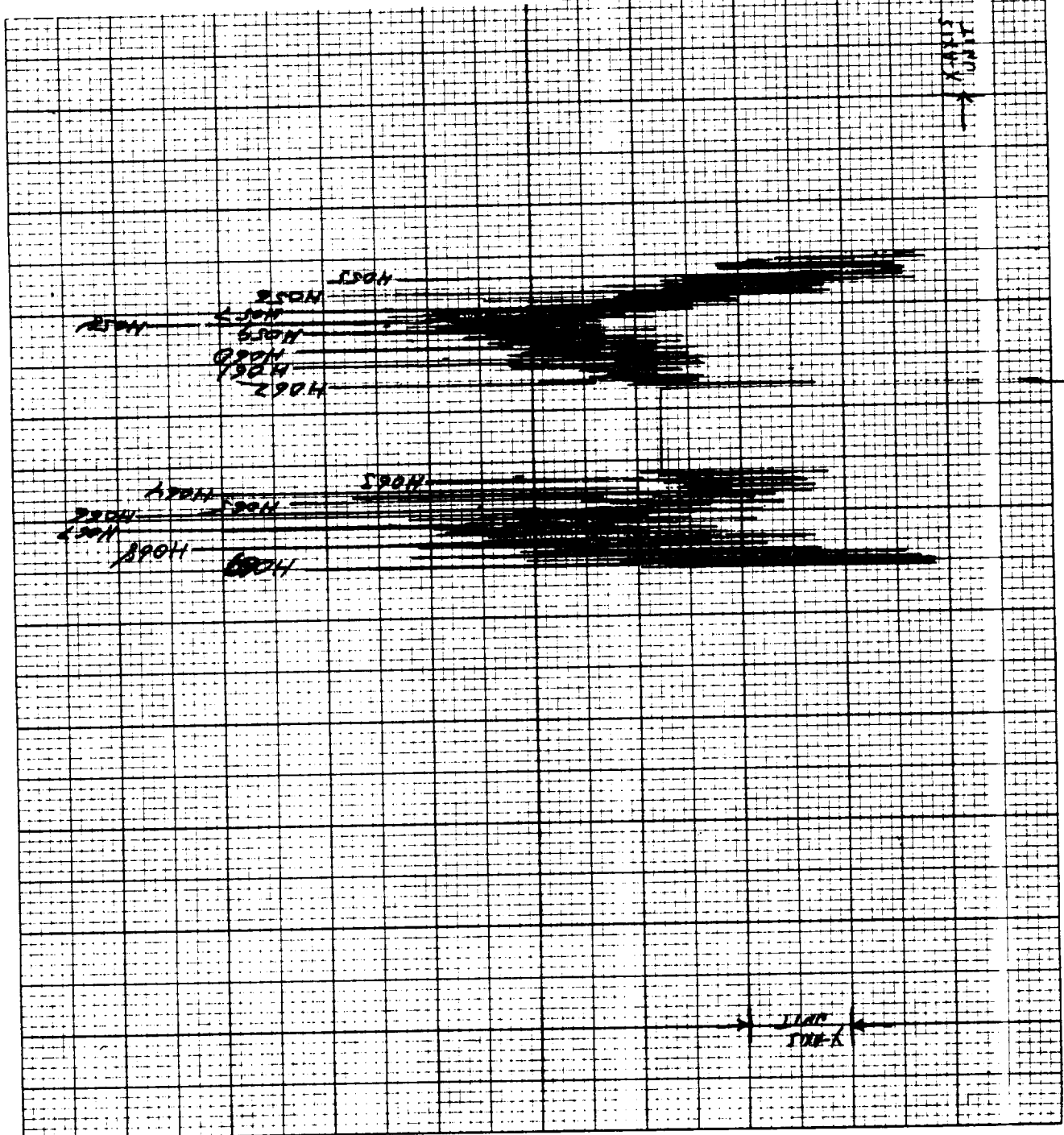
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OF POOR QUALITY

DATE: 6/2/83 NOZZLE: TAS-16  
 TEST POINT: L.V. - 3 ; ACOUSTIC - 1639  
 PLOT IDENTIFICATION: G-121

TRAVERSE DETAILS:  
 AXIAL ☒ ; ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS  $R_1$   
 LOCATIONS: TRAVERSE - VOLTS  $R_2$   
 RADIAL ☒ : E.W. - ☒ ; N.S. - ☐  
 AXIAL REF. (X=0) - 1.836 VOLTS  $X_{deg}$   
 LOCATIONS: TRAVERSE - 1.490 VOLTS  $X_{deg}$

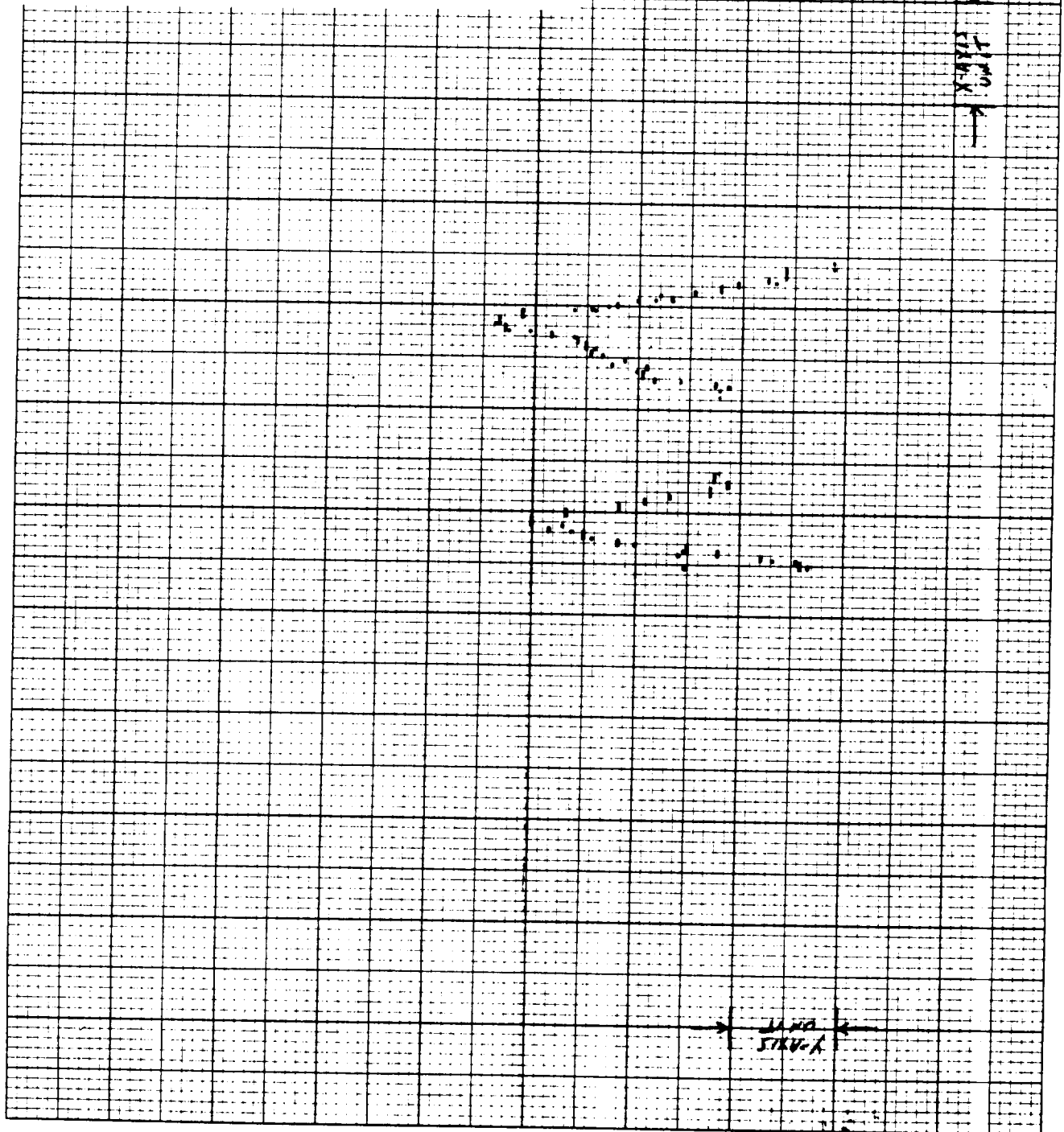
SCALE: X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- 055 TO H- 069  
 X=0



DATE: 6/3/83	NOZZLE: 745-46
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-122	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS R =
LOCATIONS: TRAVERSE	LOCATIONS: TRAVERSE
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	AXIAL REF. (X=0) - 1.836 VOLTS X = 200
LOCATIONS: TRAVERSE - 1.990 VOLTS D =	LOCATIONS: TRAVERSE - 1.990 VOLTS D =
SCALE: X-AXIS = 3.217 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H- TO H-	



DATE: 6/2/83 NOZZLE: TAS-16

TEST POINT: L.V. - 3 ; ACOUSTIC - 1639

PLOT IDENTIFICATION: G-123

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (100) - 1.836 VOLTS X = 1.50

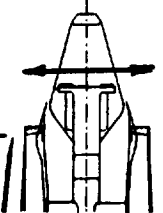
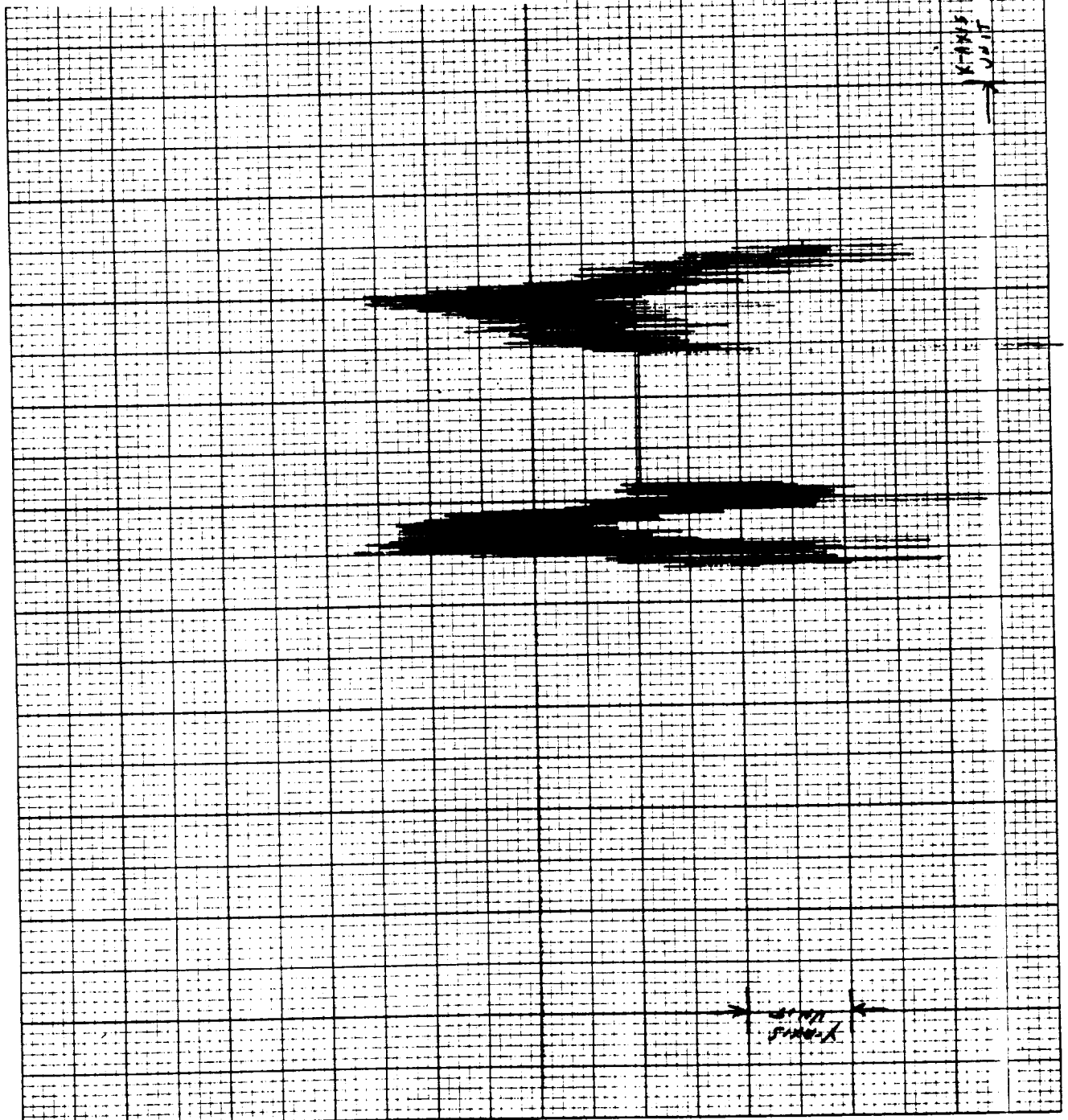
LOCATIONS: TRAVERSE - 1.95 VOLTS  $\frac{X}{D_{eq}}$

SCALE: X-AXIS= 3.317 INCH/UNIT

Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

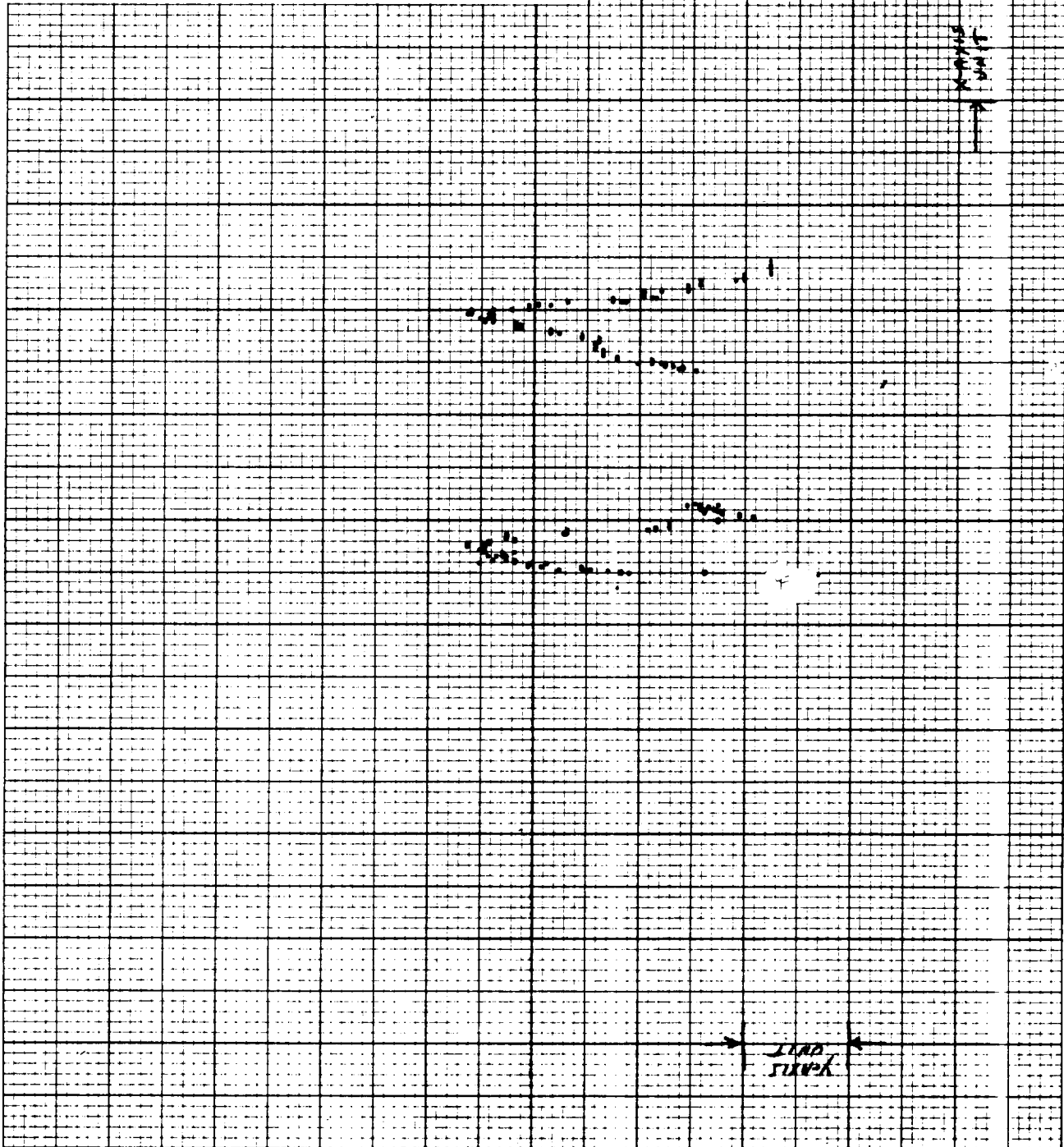
XPO

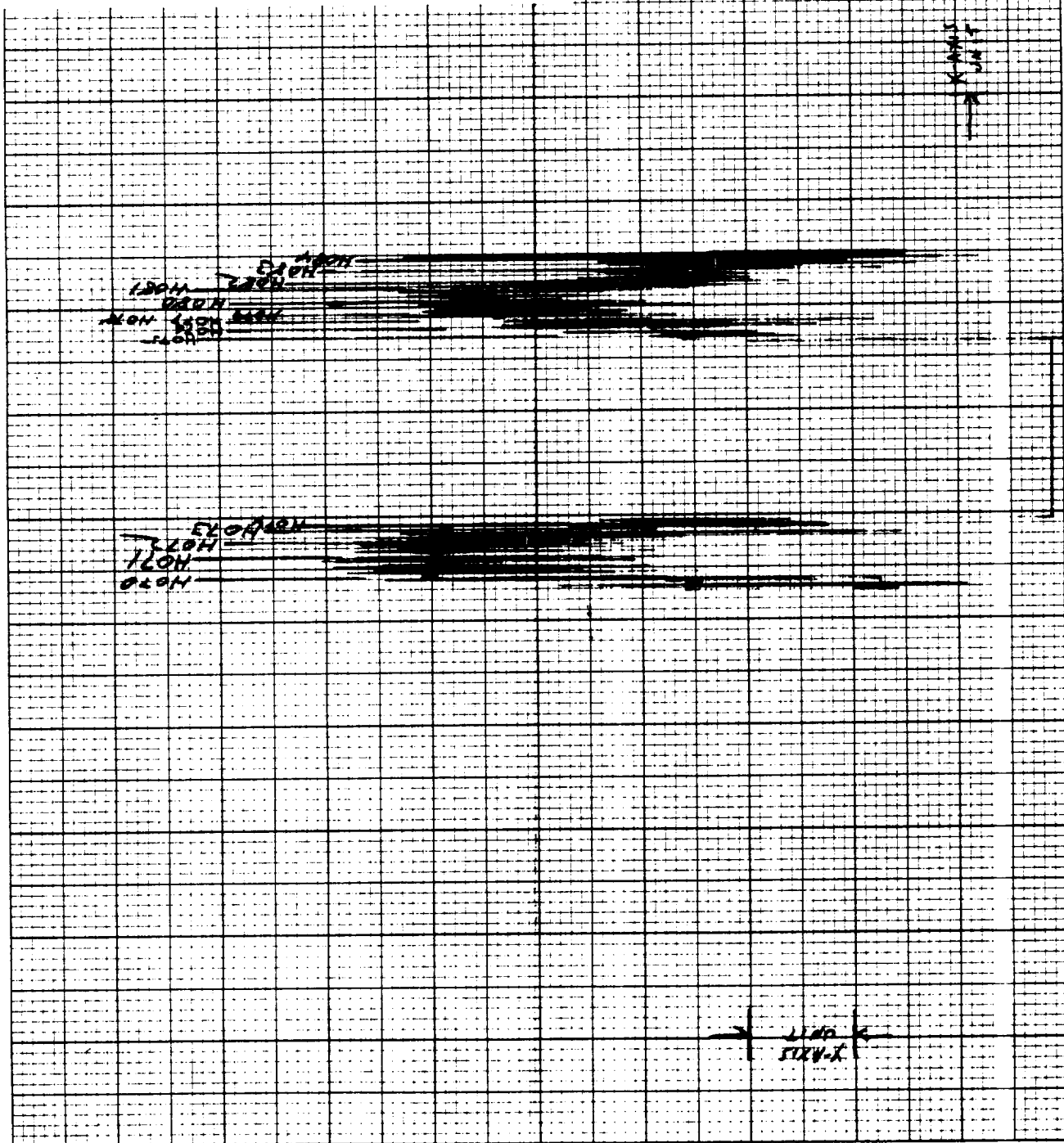
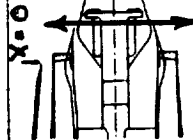
DATE: 6/2/83	NOZZLE: TAS-16
TEST POINT: L.V. - 3 ; ACOUSTIC - 1639	
PLOT IDENTIFICATION: G-124	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE -	VOLTS $R_2$
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. (X) - 1.836 VOLTS $X = 150$	
LOCATIONS: TRAVERSE - 1.951 VOLTS $D = 150$	
SCALE: X-AXIS: 3.317 INCH/UNIT	Y-AXIS: 390 F.P.S./UNIT
HISTOGRAMS: H- TO H-	



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DATE: 6/2/83	NOZZLE: TAS-16
TEST POINT: L.V. - 3 ; ACOUSTIC - 1639	
PLOT IDENTIFICATION : G - 125	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_2$
LOCATIONS: TRAVERSE -	LOCATIONS: TRAVERSE -
RADIAL X : E.W. - $\lambda$ ; M.S. - <input type="checkbox"/>	AXIAL REF. (X-0) - 1836 VOLTS $X_{eq}$
LOCATIONS: TRAVERSE - 1913 VOLTS	LOCATIONS: TRAVERSE - 1913 VOLTS
SCALE : X-AXIS = 3.317 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-070 TO H-084	

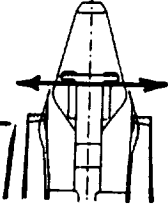
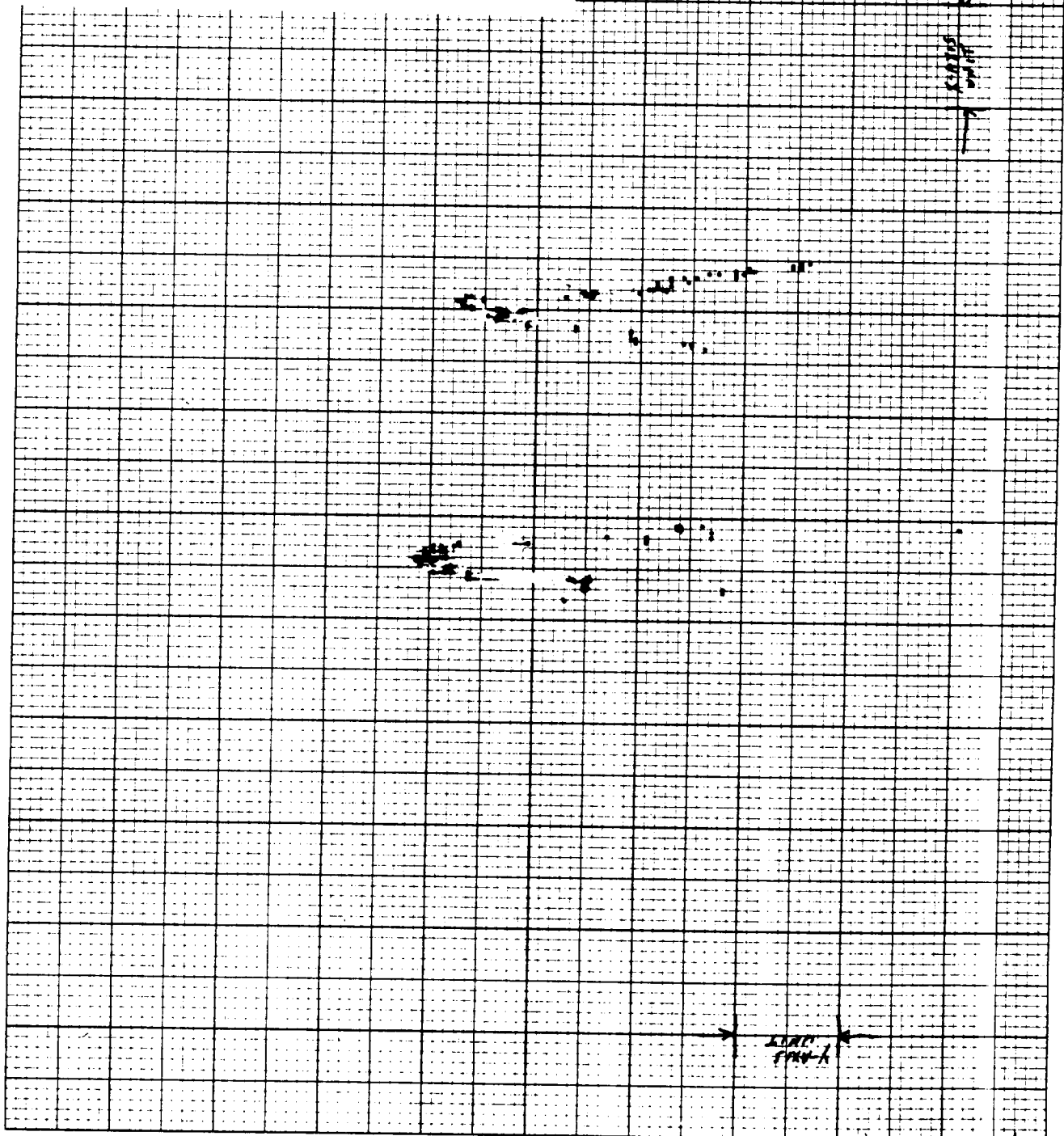


DATE: 6/2/83 NOZZLE: TAS-16  
 TEST POINT: L.V. - 3 ; ACOUSTIC - 1639  
 PLOT IDENTIFICATION: G-126

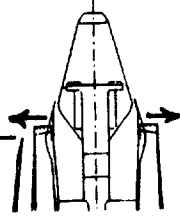
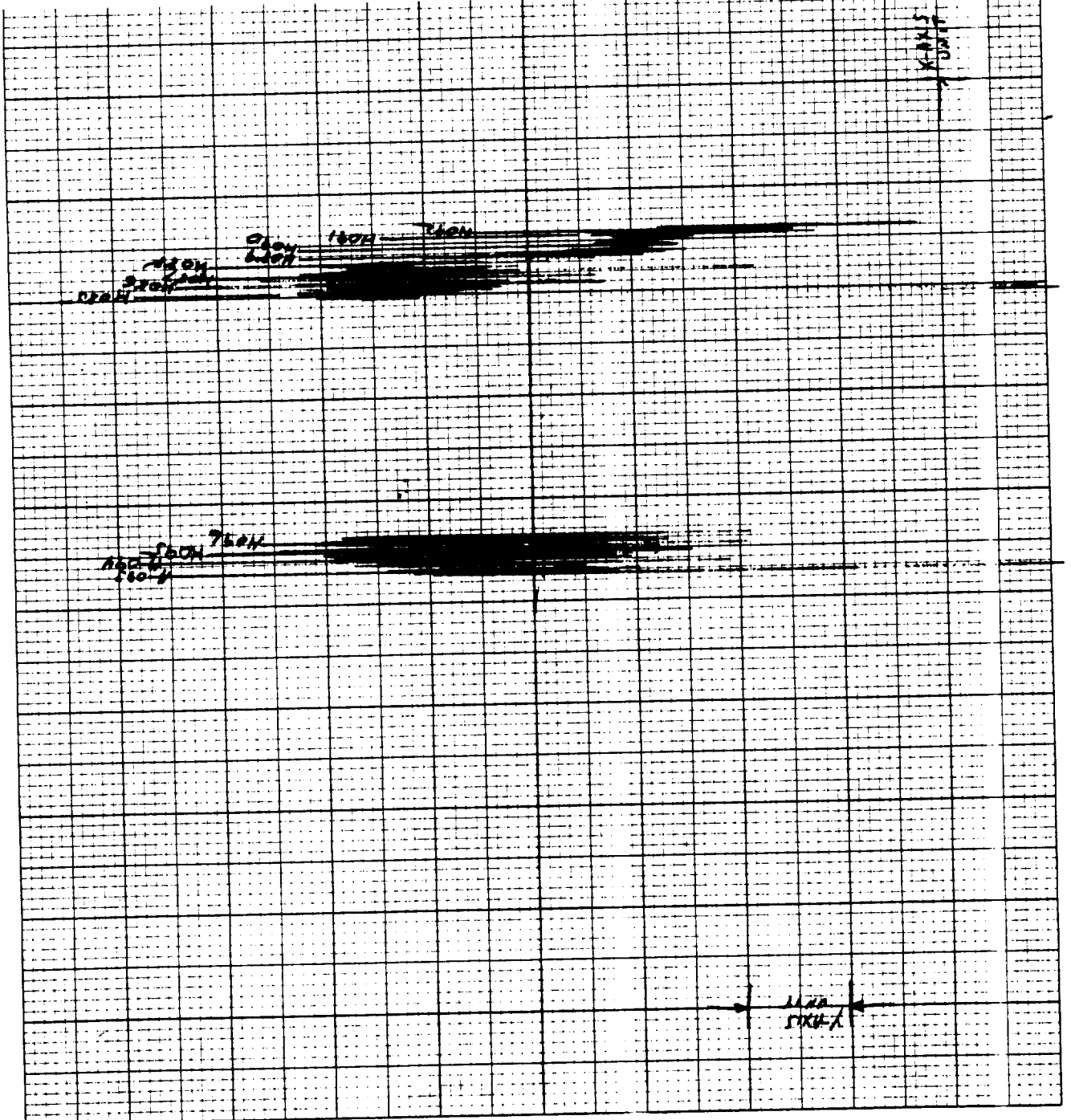
TRAVERSE DETAILS.  
 AXIAL ☐ : ☒ : ☐ : OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R  
 LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>  
 RADIAL X : E.W. - A : N.S. - ☐  
 AXIAL REF. 000-1.836 VOLTS X  
 LOCATIONS: TRAVERSE - 1.913 VOLTS D<sub>eq</sub>

SCALE : X-AXIS= 3.317 INCH/UNIT  
 Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

DATE: **6/2/83** NOZZLE: **TAS-16**  
 TEST POINT: **L.V. - 3** ; ACOUSTIC - **1639**  
 PLOT IDENTIFICATION: **G-127**  
 TRAVERSE DETAILS:  
 AXIAL ☐ : ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS  $R_1$   
 LOCATIONS: TRAVERSE - VOLTS  $R_2$   
 RADIAL ☒ : E.W. - ☒ ; N.S. - ☐  
 AXIAL REF. **(0.00)** VOLTS  $X = 0.50$   
 LOCATIONS: TRAVERSE - **1.824** VOLTS  $D_{eq}$   
 SCALE : X-AXIS = **3.317** INCH/UNIT  
 Y-AXIS = **390** F.P.S./UNIT  
 HISTOGRAMS: **H-085** TO **H-096**

DATE: 6/2/83 NOZZLE: TAs-16

TEST POINT: L.V. - 3 ; ACOUSTIC - 1639

PLOT IDENTIFICATION : G-12.8

TRAVERSE DETAILS:

AXIAL ☐ :  $\phi$  - ☐ ; OFFSET - ☐

RADIAL REF. ( $\phi$ ) - VOLTS  $\frac{R}{\phi}$

LOCATIONS: TRAVERSE VOLTS  $\frac{R}{\phi}$

RADIAL  $\times$  : E.W. -  $\times$  ; N.S. - ☐

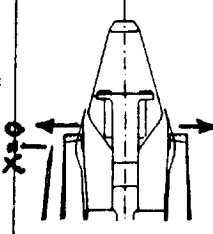
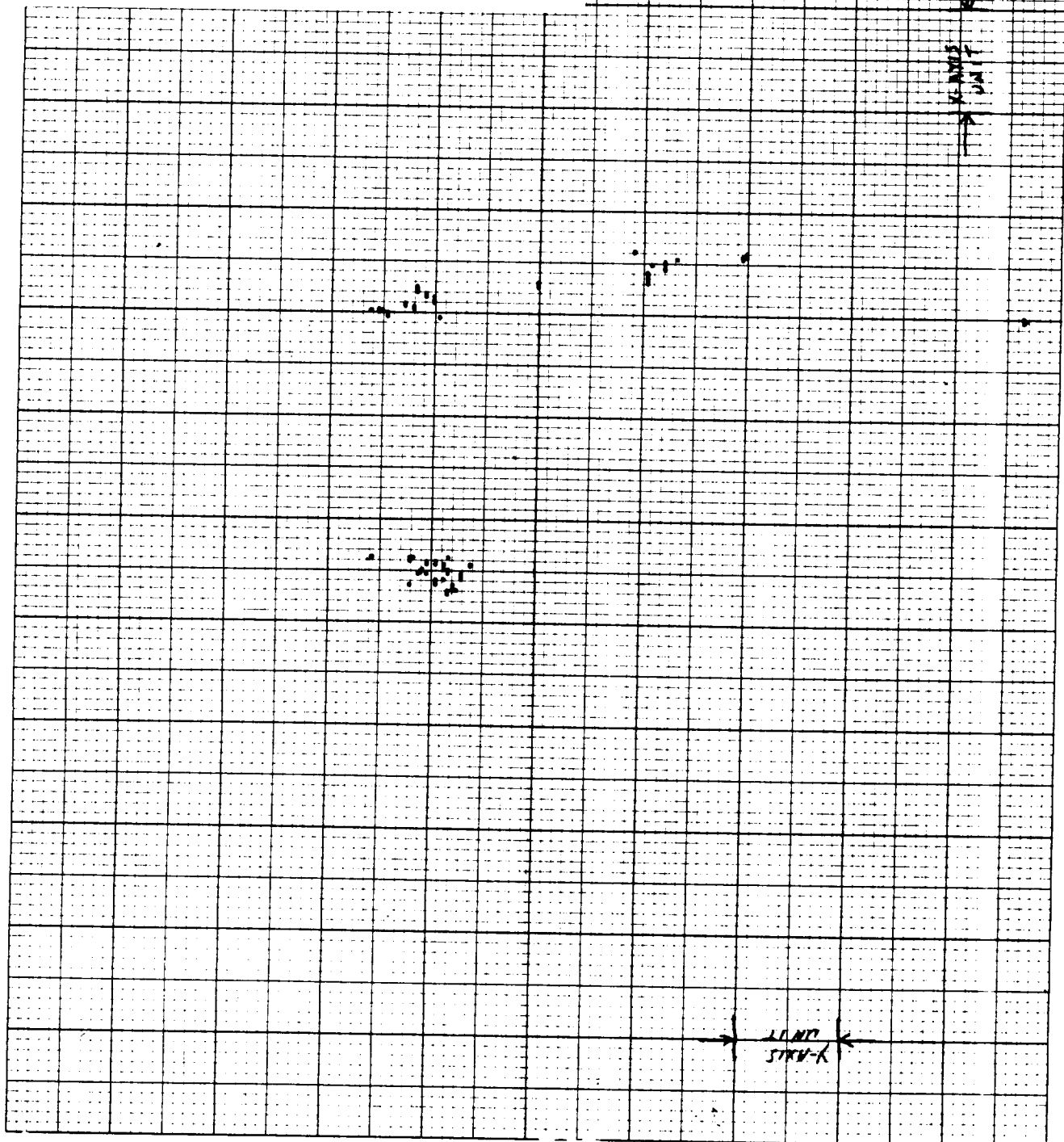
AXIAL REF. (200) 1.836 VOLTS  $\frac{X}{D}$  = 50

LOCATIONS: TRAVERSE 1.874 VOLTS  $\frac{D}{eq}$

SCALE : X-AXIS= 3.317 INCH/UNIT

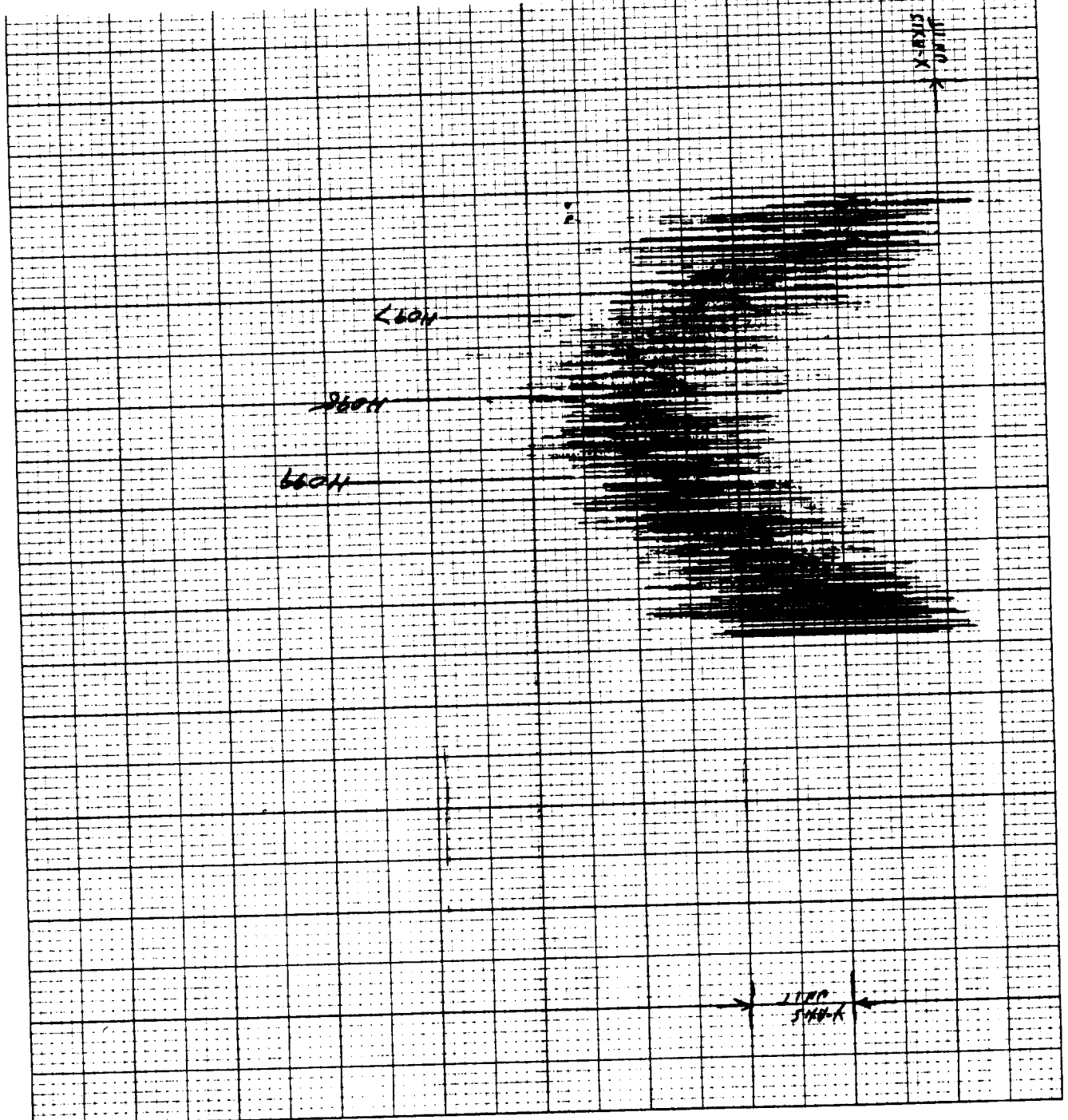
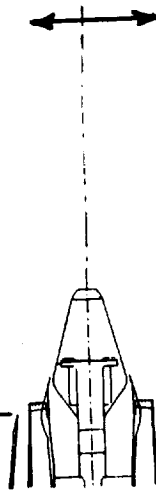
Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

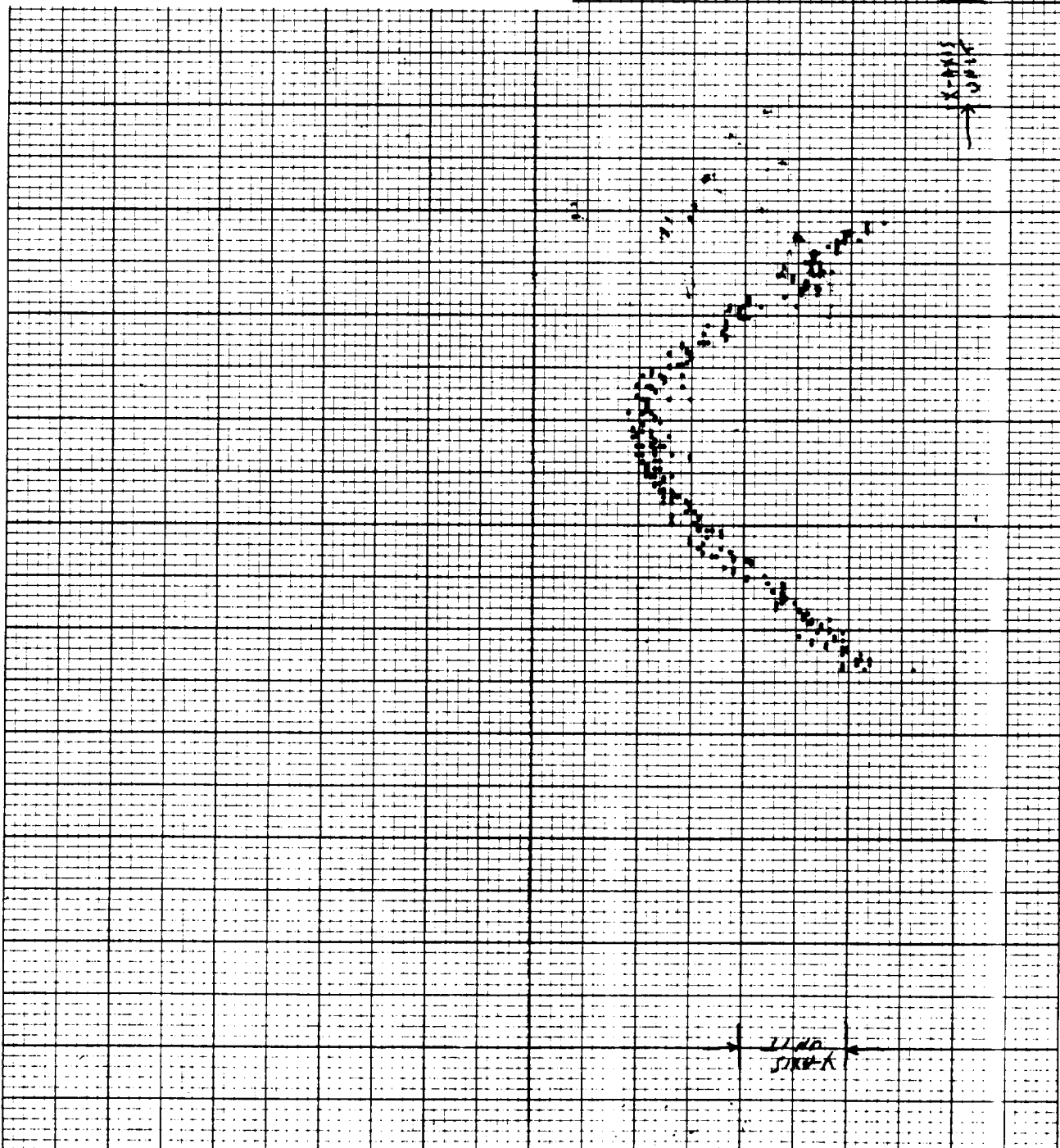


DATE: 6/2/83	NOZZLE: T45-16
TEST POINT: L.V. - 3	ACOUSTIC - 1639
PLOT IDENTIFICATION: G-129	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : $\phi$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS R =
LOCATIONS: TRAVERSE -	VOLTS R <sub>2</sub> =
RADIAL X : E.W. - X ; N.S. - <input type="checkbox"/>	AXIAL REF. (C) - 1.836 VOLTS X = 10.0
LOCATIONS: TRAVERSE 3.604 VOLTS D <sub>eq</sub>	
SCALE : X-AXIS- 3.317 INCH/UNIT	Y-AXIS- 390 F.P.S./UNIT
HISTOGRAMS: H-097 TO H-099	





DATE: <b>6/2/83</b>	NOZZLE: <b>TAS-14</b>
TEST POINT: L.V. - <b>3</b> ; ACOUSTIC - <b>1639</b>	
PLOT IDENTIFICATION : <b>6 - 130</b>	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : <input checked="" type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS <input type="checkbox"/>
LOCATIONS: TRAVERSE -	VOLTS <input type="checkbox"/>
RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> ; M.S. - <input type="checkbox"/>	AXIAL REF. <b>(X-0)-1.836</b> VOLTS <input type="checkbox"/>
LOCATIONS: TRAVERSE - <b>2604</b>	VOLTS <input type="checkbox"/>
SCALE : X-AXIS= <b>3.317</b> INCH/UNIT	Y-AXIS= <b>390</b> F.P.S./UNIT
HISTOGRAMS: H- TO H-	



LASER VELOCIMETER TEST POINT 4

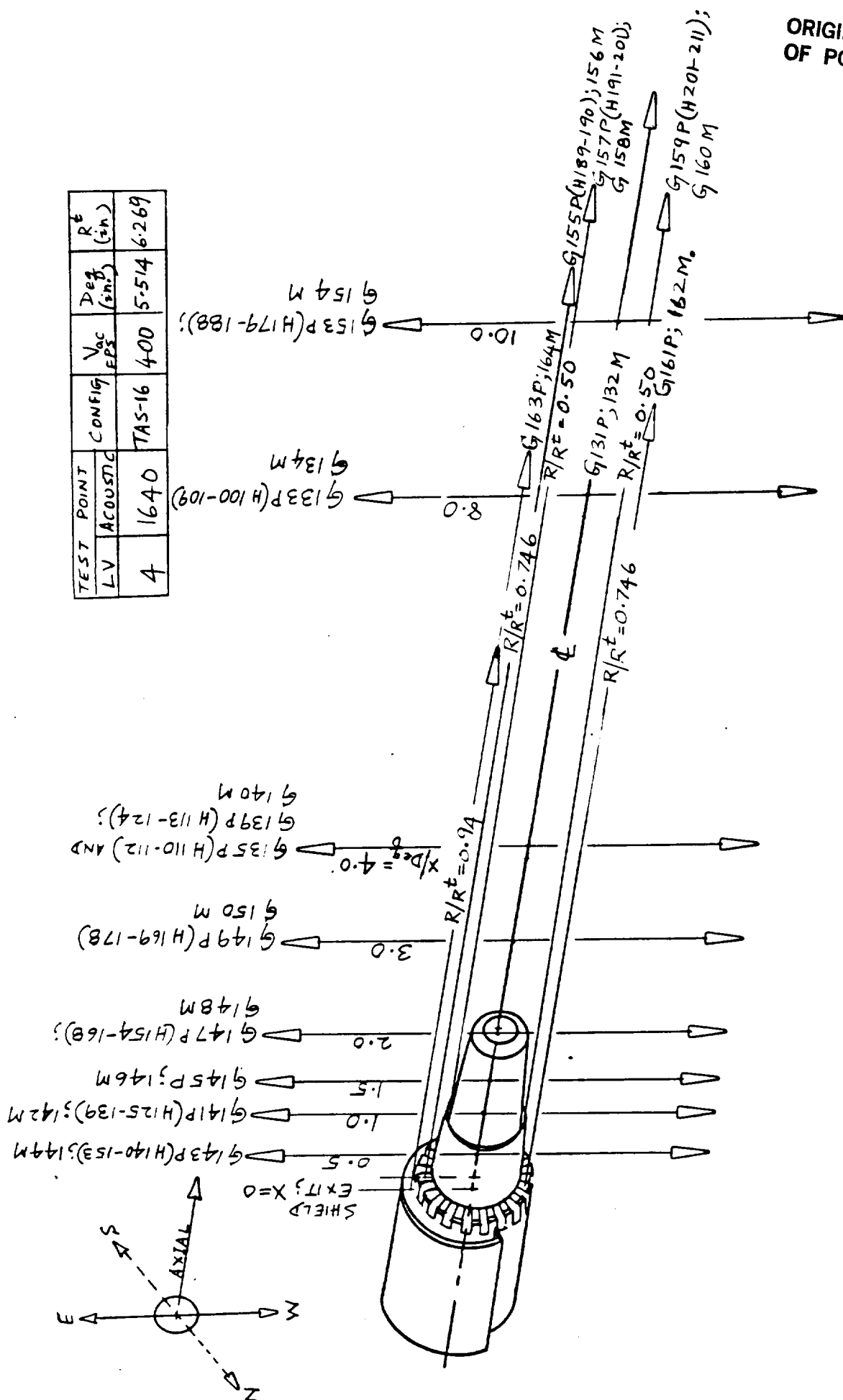
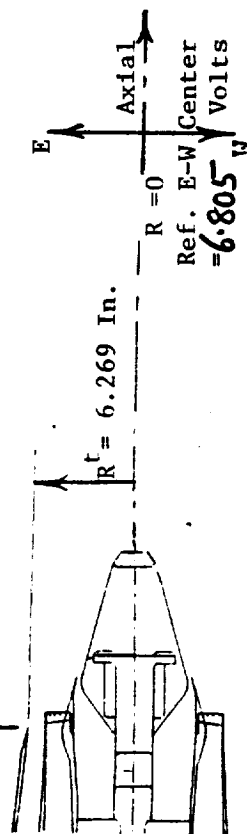


Figure 5.5 Pictorial Representation of Scope of LV Measurement on Configuration TAS-16 for LV Test Point 1640. (Matching Acoustic Test Point 1640, Simulated Flight, Takeoff Condition). (Repeat).

**= 5.514 In.**

$$\begin{array}{rcl} v_{\text{mix}} & = & \underline{2030} \text{ fps} \\ v^0 & = & \underline{2360} \text{ fps} \\ v^1 & = & \underline{1515} \text{ fps} \\ v^8 & = & \underline{1537} \text{ fps} \\ v_{\text{ac}} & = & \underline{400} \text{ fps} \end{array}$$


Graph Number		Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
Pen	Mtnl		Volts		Inches		Normalized		Feet/Sec.			Normalized	
			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	$V'/V^{mix}$
131	132	-	-	6.805	-	-	0.0	-	-	-	-	NORTH AXIS	
133	134	-	2.445	-	44.17	-	8.01	-	-	-	-	-	
		100	8.069		4.192			0.669	Insufficient Data			EAST	
		101	7.839		3.430			0.547	1594	226	0.785	0.111	
		102	7.626		2.723			0.434	1673	180	0.824	0.089	
		103	7.340		1.775			0.283	1613	150	0.795	0.074	
		104	7.083		0.922			0.147	1539	122	0.758	0.06	
		105	6.669		0.451			0.072	1433	105	0.706	0.052	
		106	6.403		1.333			0.213	1384	107	0.682	0.053	
		107	6.618		0.620			0.099	1402	128	0.691	0.063	

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.83), Volts

Configuration: TAS-16

LV Test Point: 4

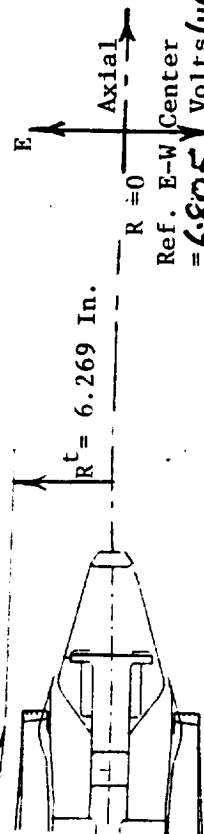
Matching

Acoustic Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$v^{mix} =$  2030 fps  
 $v^0 =$  2360 fps  
 $v^1 =$  1575 fps  
 $v^8 =$  1537 fps  
 $v^{ac} =$  400 fps



Ref. E-W Center  
 = 6.805 Volts (UPTO H112) 6/2/83  
6.820 Volts (FOR > H112) 6/3/83

Graph Number		Transverse Type (Ax.-E-W)	Histogram Number	Location (X and R)						Velocity (V and V')				Comments
				Volts		Inches		Normalized		Feet/Sec.		Normalized		
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
133			108	2.445	5.368	44.17	3.108	8.01	0.496	1384	146	0.682	0.072	WEST
↓			109	↓	5.639	↓	3.867	↓	0.617	1230	200	0.061	0.099	↓
135		E-W	-	2.138	-	22.09	-	4.00	-	-	-	-	-	-
			110		7.684		2.915		0.465	1982	121	0.976	0.06	EAST
			111		5.954		2.823		0.450	1632	137	0.804	0.068	WEST
			112	↓	6.466	↓	1.124	↓	0.179	1273	58	0.627	0.029	WEST
139	140	E-W	-	2.138	-	22.09	-	4.00	-	-	-	-	-	-
			113		7.794		3.231		0.515	1964	162	0.968	0.08	EAST
			114		7.794		3.231		0.515	1962	148	0.967	0.073	EAST
↓			115	↓	6.003	↓	2.710	↓	0.432	1638	141	0.807	0.07	WEST

**Table 5-V. Laser Velocimeter Measurement Data**

**Configuration: TAS-16**

**LV Test Point: 4**

## Matching

Acoustic  
Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^I)/\pi}$$

**= 5.514 In.**

X=0 (Ref. Shield Exit) = 1.831, Volts

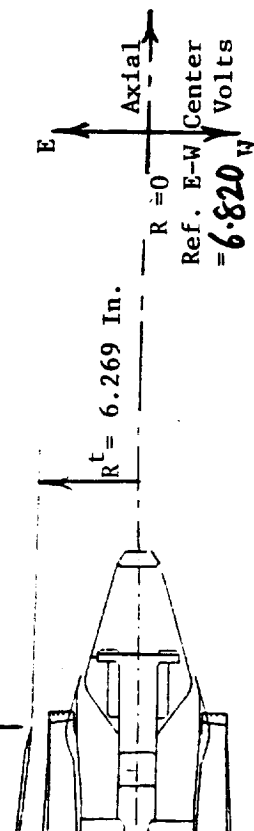

$$\begin{array}{r} \text{fps} \\ \hline 2030 \\ \hline \text{fps} \\ \hline 2360 \\ \hline \text{fps} \\ \hline 1515 \\ \hline \text{fps} \\ \hline 1537 \\ \hline \text{fps} \\ \hline 400 \end{array}$$
[illegible]

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831 , Volts

Configuration: TAS-16

LV Test Point: 4

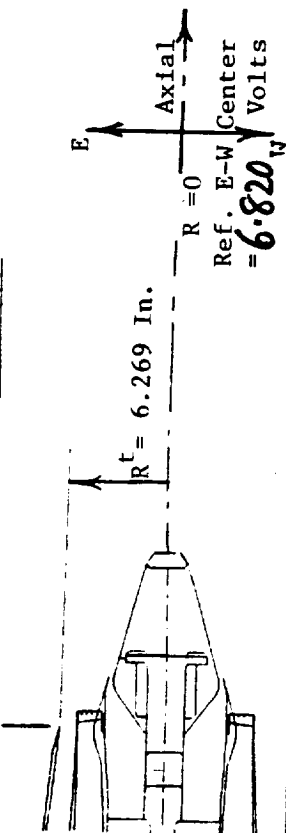
Matching

Acoustic Test Point: 6640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$v^{mix} = 2030$  fps  
 $v^0 = 2360$  fps  
 $v^1 = 1515$  fps  
 $v^s = 1537$  fps  
 $v_{ac} = 400$  fps



Graph Number		Type (Ax. E-W)	Histogram Number	Location (X and R)				Velocity (V and V')					Comments	
				Volts		Inches		Normalized		Feet/Sec.				
										$\bar{V}$	V'	$\bar{V}/V^{mix}$		$V'/V^{mix}$
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
141	142	E-W	-	1.908	-	5.539	-	1.00	-	-	-	-	-	-
			125		5.407		4.687		0.748	1765	335	0.87	0.165	WEST
			126		5.510		4.345		0.693	2237	109	1.102	0.054	
			127		5.616		3.993		0.637	2217	95	1.092	0.047	
			128		5.705		3.698		0.590	2278	101	1.122	0.05	
			129		5.799		3.386		0.540	1770	311	0.872	0.153	
			130		5.924		2.972		0.474	1371	98	0.675	0.048	✓
			131		7.879		3.512		0.560	Insufficient	Samples			EAST
			132		7.719		2.982		0.476	1316	39	0.648	0.019	
			133	✓	7.968	✓	3.808	✓	0.607	2093	171	1.031	0.084	✓

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit) = 1.831, Volts

Configuration: TAS-16

LV Test Point: 4

Matching

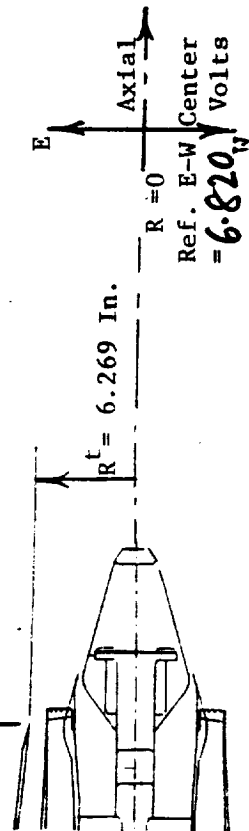
Acoustic

Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} = 2030$  fps  
 $V^0 = 2360$  fps  
 $V^1 = 1515$  fps  
 $V^S = 1537$  fps  
 $V_{ac} = 400$  fps



Graph Number		Location (X and R)				Velocity (V and V')				Comments		
Pen	Mini	Volts		Inches		Normalized		Feet/Sec.			Normalized $\bar{V}/V^{mix}$	
		Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'			
141		1.908	8.087	5.539	4.202	1.00	0.670	2152	99	1.06	0.049	EAST
			8.170		4.478		0.714	2219	88	1.093	0.043	
			8.274		4.823		0.769	476	69	0.727	0.034	
			8.348		5.068		0.808	1442	79	0.710	0.039	
			8.425		5.323		0.849	1275	172	0.628	0.085	
			8.458		5.433		0.867	1118	204	0.551	0.100	Y
143	144	1.869	-	2.734	-	0.50	-	-	-	-	-	-
			5.317		4.985		0.795	2096	187	1.033	0.092	WEST
			5.412		4.670		0.745	2005	261	1.002	0.129	
			5.503		4.368		0.697	2044	247	1.007	0.122	Y



Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831), Volts

Configuration: TAS-16

LV Test Point: 4

Matching

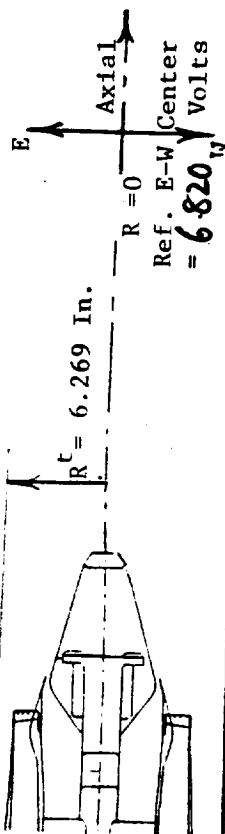
Acoustic

Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

$$= 5.514 \text{ In.}$$

$V^{mix} = 2030$  fps  
 $V^0 = 2360$  fps  
 $V^1 = 1515$  fps  
 $V^S = 1537$  fps  
 $V_{ac} = 400$  fps



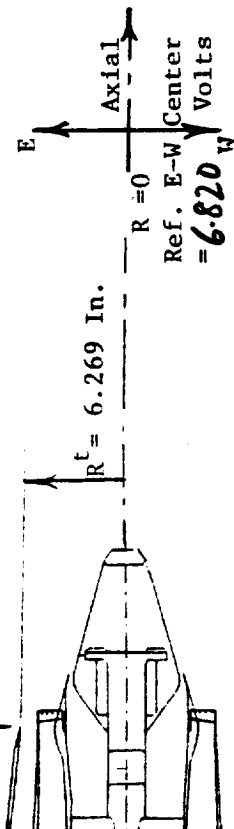
Graph Number		Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')					Comments	
Pen	Mini			Volts		Inches		Normalized			Feet/Sec.			
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	Normalized		
												$\bar{V}/V^{mix}$		
143			143	1.869	5.563	2.734	4.169	0.50	0.665	2061	221	1.015	0.109	WEST
			144		5.616		3.993		0.637	2217	160	1.092	0.079	↓
			145		8.046		4.066		0.649	2303	174	1.134	0.086	EAST
			146		8.101		4.249		0.678	2184	221	1.076	0.109	
			147		8.158		4.438		0.708	2134	268	1.051	0.132	
			148		8.247		4.733		0.755	2149	267	1.059	0.132	
			149		8.341		5.045		0.805	2225	194	1.096	0.096	
			150		8.341		5.045		0.805	2198	198	1.083	0.098	
			151		8.419		5.303		0.846	1591	76	0.784	0.037	
			152		8.481		5.509		0.879	1567	64	0.772	0.032	↓

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831), Volts

Configuration: TAS-16  
 LV Test Point: 4  
 Matching  
 Acoustic  
 Test Point: 1640  
 $D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$   
 = 5.514 In.

$v^{mix} =$  2030 fps  
 $v^0 =$  2360 fps  
 $v^1 =$  1515 fps  
 $v^s =$  1537 fps  
 $v_{ac} =$  400 fps



Graph Number			Traverse Type (Ax. - F-W)	Histogram Number	Location (X and R)				Velocity (V and V')					Comments	
Pen	Mini	Volts			Inches		Normalized		Feet/Sec.		Normalized				
		Axial			E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$		
143			153	1.869	8.570	2.734	5.804	0.50	0.926	1523	68	0.750	0.034	EAST	
145	146		-	1.946	-	8.273	-	1.50	-	-	-	-	-	-	-
147	148		-	1.985	-	11.079	-	2.00	-	-	-	-	-	-	-
			154		8.243		4.886		0.779	914	186	0.45	0.092	EAST	
			155		8.235		4.693		0.749	1070	190	0.527	0.094		
			156		8.159		4.441		0.708	1284	161	0.633	0.079		
			157		8.072		4.153		0.662	1461	118	0.72	0.058		
			158		7.930		3.682		0.587	2025	215	0.998	0.106		
			159		7.782		3.191		0.509	2011	137	0.991	0.068		
✓			160	✓	7.662	✓	2.793	✓	0.445	1710	144	0.842	0.07	✓	✓

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit) = 1.831, Volts

Configuration: TAS-16

LV Test Point: 4

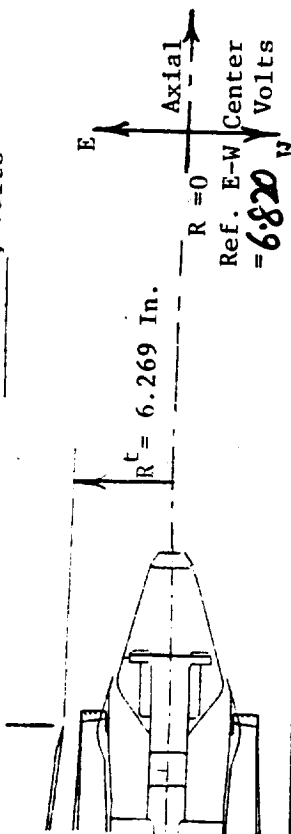
Matching  
Acoustic

Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} = 2030$  fps  
 $V^0 = 2030$  fps  
 $V^1 = 1537$  fps  
 $V^8 = 1537$  fps  
 $V_{ac} = 400$  fps



Graph Number		Type (Ax.-E-W)	Histogram Number	Location (X and R)				Velocity (V and V')					Comments	
Pen	Min1			Volts		Inches		Normalized		Feet/Sec.				
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	Normalized		
												$\bar{V}/V^{mix}$		
147			161	1.985	7.500	11.079	2.255	2.00	0.360	1638	136	0.807	0.067	EAST
			162		7.330		1.692		0.270	1488	87	0.733	0.043	EAST
			163		6.322		1.652		0.263	1275	97	0.628	0.048	WEST
			164		6.177		2.133		0.340	1138	105	0.561	0.052	
			165		5.993		2.743		0.438	1569	211	0.773	0.104	
			166		5.877		3.128		0.500	1949	202	0.96	0.10	
			167		5.744		3.569		0.569	1922	264	0.947	0.13	
			168		5.642		3.907	Y	0.623	1517	317	0.747	0.156	Y
149	150	E-W	-	2.061	-	16.547	-	3.00	-	-	-	-	-	-
			169		7.723		2.995	↓	0.478	2024	125	0.997	0.062	EAST

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831, Volts

Configuration: TAS-16  
LV Test Point: 4  
Matching  
Acoustic  
Test Point: 1640  
 $D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$   
= 5.514 In.

$v^{mix} =$  2030 fps  
 $v^0 =$  2360 fps  
 $v^1 =$  1515 fps  
 $v^s =$  1537 fps  
 $v_{ac} =$  400 fps



Graph Number		Traverse Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.				
Pen	Mini	Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$			
149			170	2.061	6.903	16.547	0.275	3.00	0.044	1149	142	0.566	0.07	EAST
			171		6.012		2.680		0.427	1669	157	0.822	0.077	WEST
			172		5.834		3.270		0.522	1569	205	0.773	0.101	
			173		6.195		2.073		0.331	1470	152	0.724	0.075	
			174		6.410		1.360		0.217	1208	74	0.595	0.037	Y
			175		7.133		1.038		0.166	1399	145	0.689	0.071	EAST
			176		7.300		1.592		0.254	1572	99	0.774	0.049	
			177		7.513		2.300		0.368	1722	108	0.848	0.053	
			178		7.940		3.715		0.593	1643	186	0.809	0.092	Y
153	154	E-W	-	2.600	-	55.32	-	10.03	-	-	-	-	-	-

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1831, Volts

Configuration: TAS-16

LV Test Point: 4

Matching

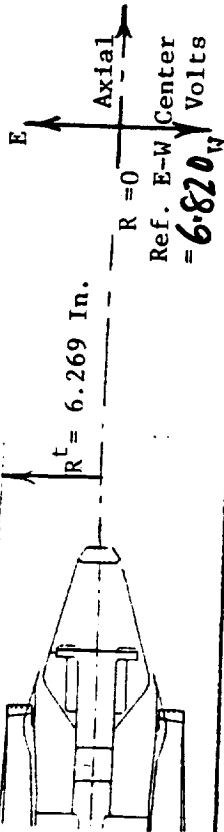
Acoustic

Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

$V^{mix} = \underline{2030}$  fps  
 $V^0 = \underline{2360}$  fps  
 $V^1 = \underline{1515}$  fps  
 $V^S = \underline{1537}$  fps  
 $V_{ac} = \underline{400}$  fps



Graph Number		Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
			Volts		Inches		Normalized		Feet/Sec.				
Pen	Mini	Traverse Type (Ax. - E-W)	Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
153			2.600	5.690	55.32	3.748	10.03	0.598	1229	173	0.060	0.085	WEST
		179											
		180		6.082		2.448		0.390	1369	132	0.674	0.065	
		181		6.352		1.552		0.248	1443	139	0.711	0.069	
		182		6.352		1.552		0.248	1432	122	0.705	0.06	
		183		6.710		0.365		0.058	1490	120	0.734	0.059	↓
		184		7.064		0.809		0.129	1557	136	0.767	0.067	EAST
		185		7.395		1.907		0.304	1557	166	0.767	0.082	
		186		7.395		1.907		0.304	1559	150	0.768	0.074	
		187		7.743		3.061		0.488	1443	198	0.711	0.098	
✓		188	✓	8.055	✓	4.096		0.653	1229	231	0.605	0.114	↓

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.83), Volts

Configuration: TAS-16

LV Test Point: 4

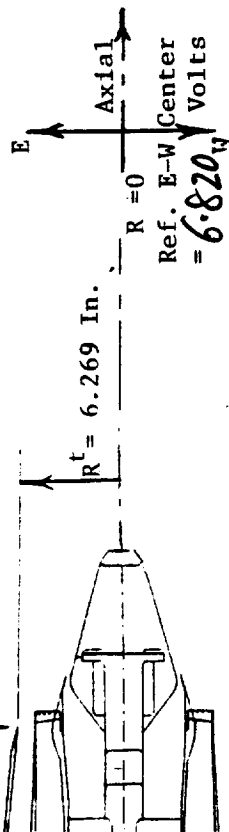
Matching

Acoustic

Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.



$V^{mix} = 2030$  fps  
 $V^0 = 2360$  fps  
 $V^1 = 1515$  fps  
 $V^S = 1537$  fps  
 $V_{ac} = 400$  fps

Graph Number		Traverse Type (Ax.-T-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments	
				Volts		Inches		Normalized		Feet/Sec.			Normalized
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$
155	156	AXIAL	-	-	8.231	-	4.680	-	0.746	-	-	-	EAST
↓			189	2.599	↓	55.25	↓	10.02	↓	1080	231	0.532	0.114
↓			190	2.445	↓	44.17	↓	8.01	↓	Insufficient	Samples	↓	↓
157	158	AXIAL	-	-	7.762	-	3.124	-	0.50	-	-	-	EAST
↓			191	2.599	↓	55.25	↓	10.02	↓	1434	210	0.706	0.103
↓			192	2.445	↓	44.17	↓	8.01	↓	1621	207	0.799	0.102
↓			193	2.368	↓	38.63	↓	7.01	↓	1736	186	0.855	0.092
↓			194	2.291	↓	33.09	↓	6.60	↓	1842	168	0.907	0.083
↓			195	2.214	↓	27.55	↓	5.00	↓	1932	144	0.952	0.071
↓			196	2.138	↓	22.09	↓	4.00	↓	1983	134	0.977	0.066

Table 5-V.

Configuration: TAS-16

**LV Test Point:**

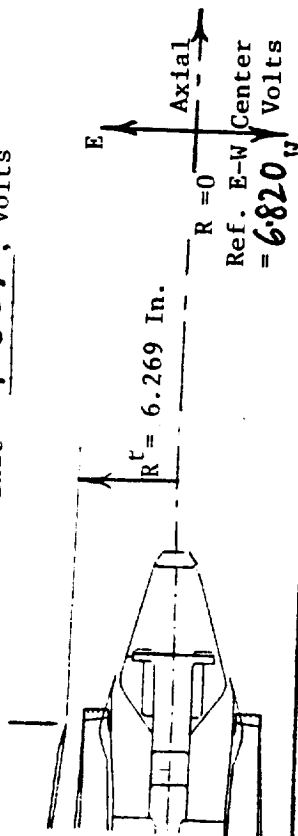
### Matching

## Acoustic

**Test Point:**

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi} = 5.514 \text{ in.}$$

X=0 (Ref. Shield Exit) = 1.831, Volts


$$\begin{array}{r} v^{\text{mix}} = \underline{2030} \text{ fps} \\ v^0 = \underline{2360} \text{ fps} \\ v^1 = \underline{1515} \text{ fps} \\ v^8 = \underline{1537} \text{ fps} \\ v_{ac} = \underline{400} \text{ fps} \end{array}$$

6.820 V volts

Graph Number		Type (Ax. - E-W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.			Normalized	
Pen	Mini			Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'	$\bar{V}/V^{mix}$	$V'/V^{mix}$	
157			197	2.138	7.762	22.09	3.124	4.00	0.50	2005	121	0.988	0.06	EAST
			198	2.100		19.35		3.51		2014	133	0.992	0.066	
			199	2.061		16.55		3.00		2032	136	1.00	0.067	
			200	2.023		13.81		2.51		2034	142	1.002	0.07	
			201	1.985		11.08		2.01		1900	152	0.936	0.075	↓
159	160	AXIAL	-	-	5.883	-	3.108	-	0.50	-	-	-	-	WEST
			202	2.599		53.25		10.02		1324	152	0.652	0.075	
			203	2.445		44.17		8.01		1378	157	0.679	0.077	
			204	2.368		38.63		7.01		1398	172	0.689	0.085	
			205	2.291		33.09		6.00		1476	161	0.727	0.079	↓

Table 5-V. Laser Velocimeter Measurement Data

X=0 (Ref. Shield Exit = 1.831 , Volts

Configuration: TAS-16

LV Test Point: 4

Matching

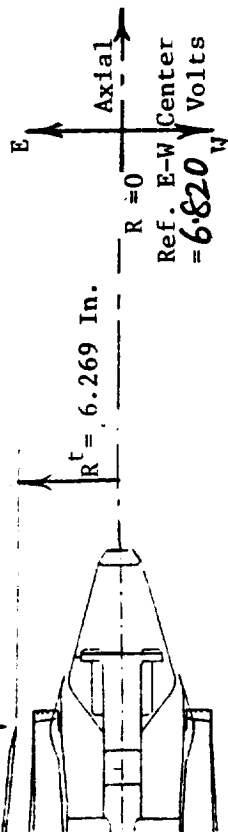
Acoustic

Test Point: 1640

$$D_{eq} = \sqrt{4(A^0 + A^1)/\pi}$$

= 5.514 In.

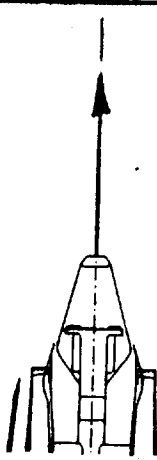
$v^{mix} = \underline{2030}$  fps  
 $v^0 = \underline{2360}$  fps  
 $v^1 = \underline{1515}$  fps  
 $v^s = \underline{1537}$  fps  
 $v_{ac} = \underline{400}$  fps



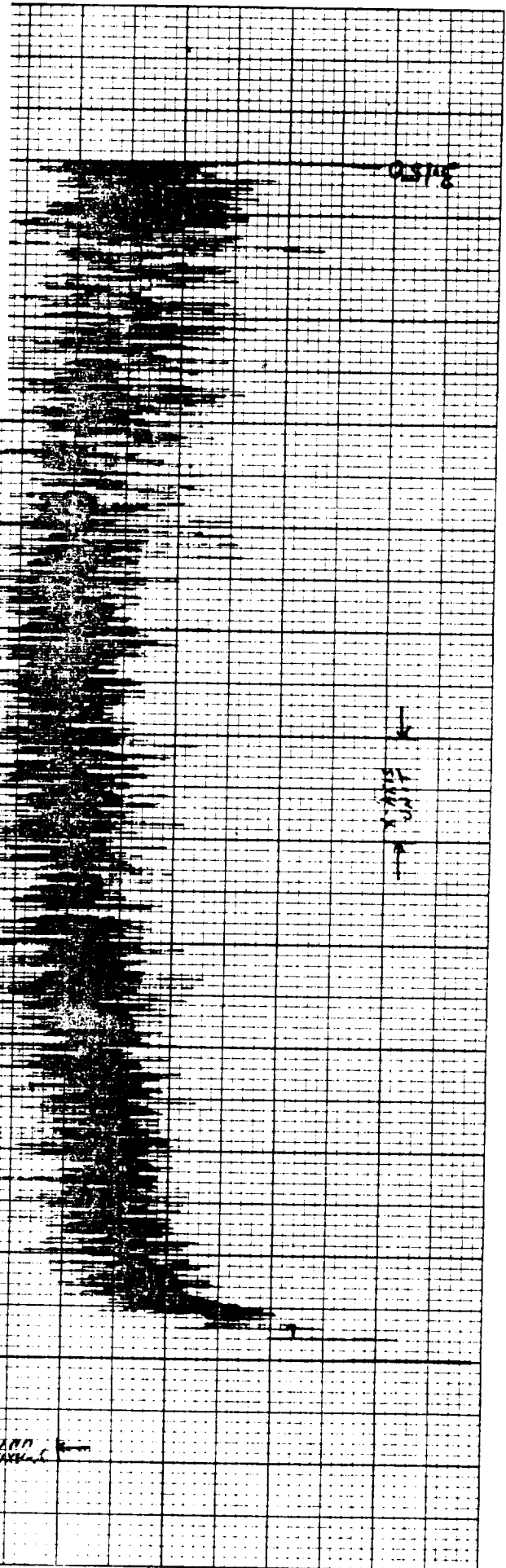
Graph Number		Traverse Type (X - F - W)	Histogram Number	Location (X and R)				Velocity (V and V')				Comments		
				Volts		Inches		Normalized		Feet/Sec.				
				Axial	E-W	Axial	E-W	X/D <sub>eq</sub>	R/R <sup>t</sup>	$\bar{V}$	V'		$\bar{V}/V^{mix}$	V'/V <sup>mix</sup>
159			206	2.214	5.883	27.55	3.108	5.00	0.50	1508	160	0.743	0.079	WEST
			207	2.138		22.09		4.00		1582	151	0.779	0.074	
			208	2.100		19.35		3.51		1605	158	0.791	0.078	
			209	2.061		16.55		3.00		1637	181	0.806	0.089	
			210	2.023		13.81		2.51		1758	219	0.866	0.108	
			211	1.985		11.08		2.01		1905	220	0.938	0.108	✓
161	162	AXIAL	-	-	5.409	-	4.68	-	0.746	-	-	-	-	WEST
163	164	AXIAL	-	-	8.609	-	5.92	-	0.944	-	-	-	-	EAST
	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-	-



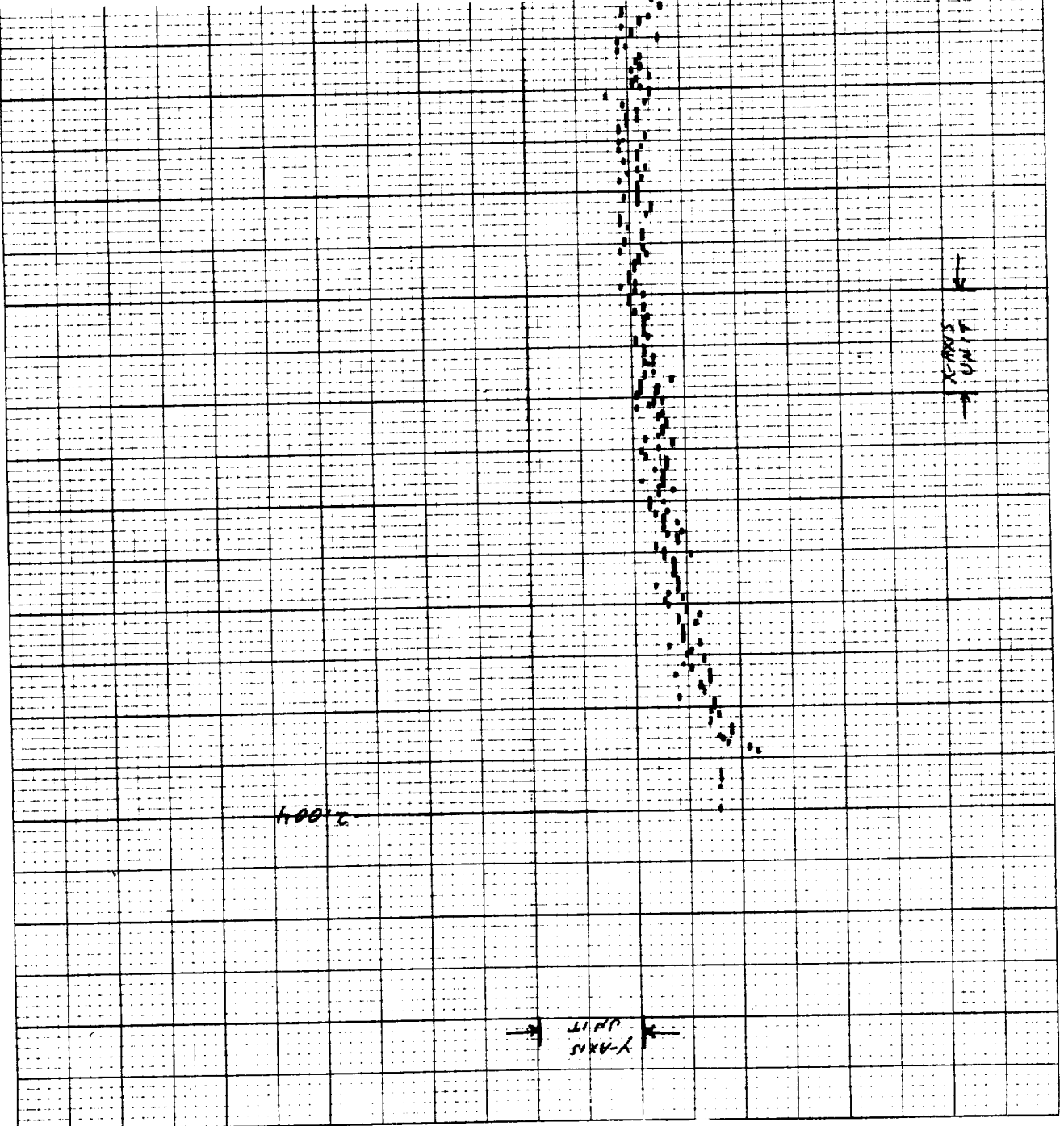
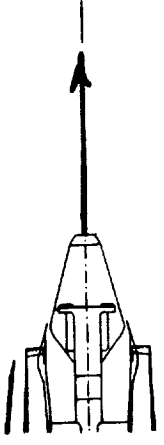
DATE: 6/2/83	NOZZLE: TAS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: 6-131	
TRAVERSE DETAILS:	
AXIAL: <input checked="" type="checkbox"/> ; OFFSET: <input type="checkbox"/>	
RADIAL: REF. ( ) - 6.005 VOLTS R-00	
LOCATIONS: TRAVERSE: 6.005 VOLTS R-2	
RADIAL: <input type="checkbox"/> ; E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL: REF. ( ) - VOLTS X =	
LOCATIONS: TRAVERSE - VOLTS D eg	
SCALE: X-AXIS= 7.20 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



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OF POOR QUALITY

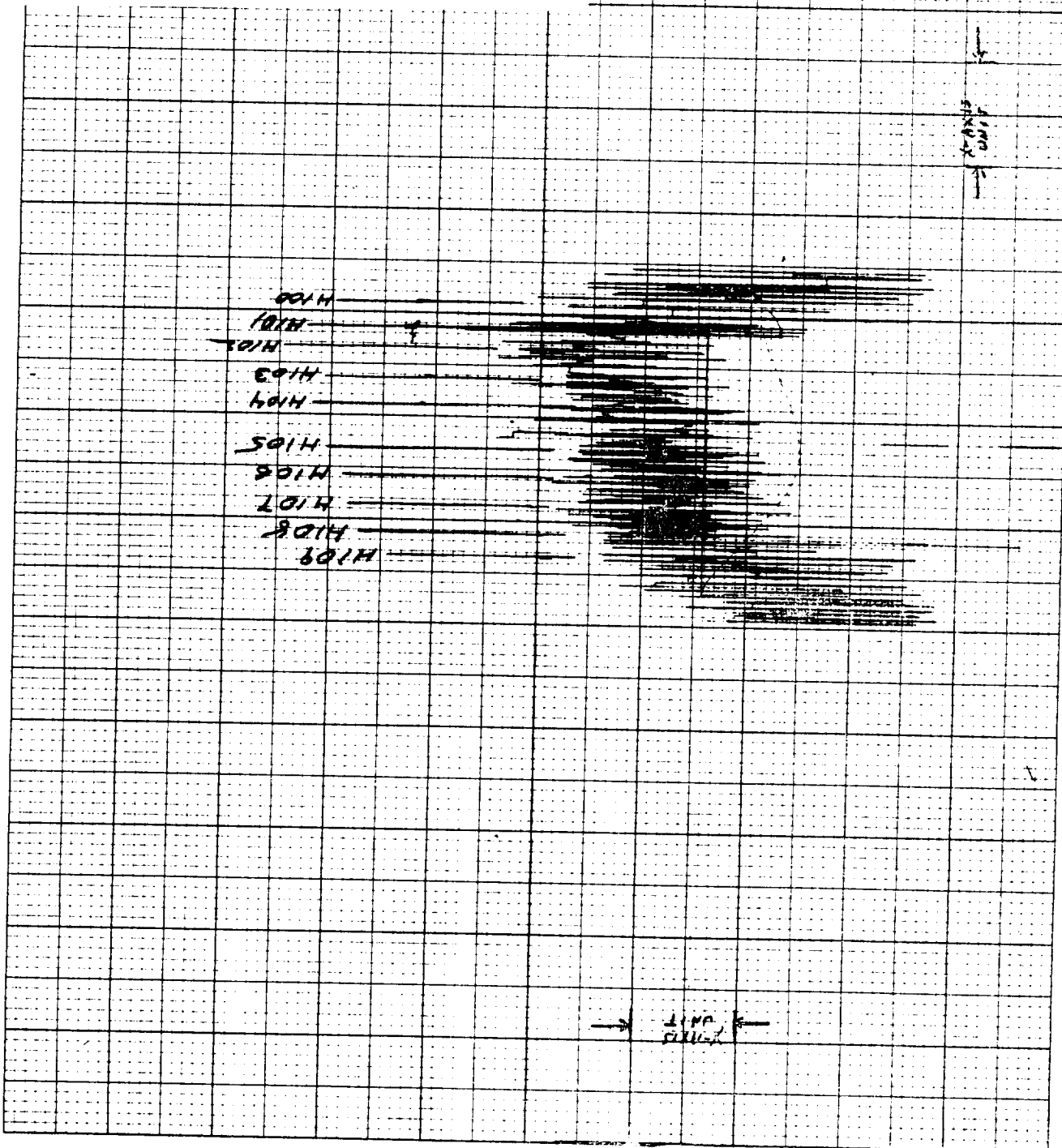
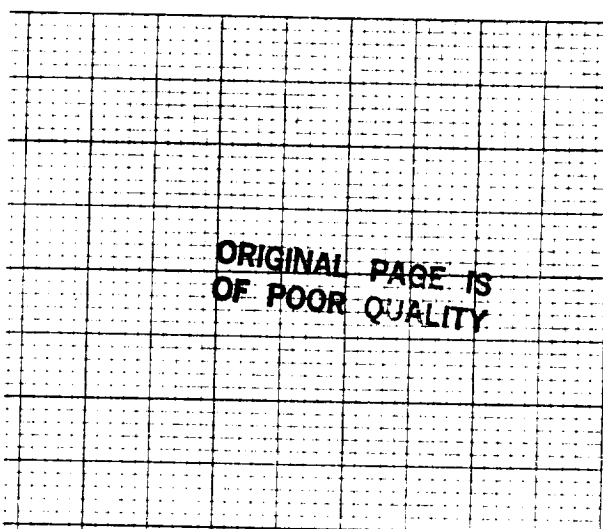
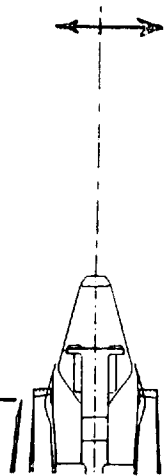


DATE: 6/2/83	NOZZLE: TAS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-132	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> ; OFFSET - <input type="checkbox"/>	
RADIAL REF. ( ) - 6.805 VOLTS	R = 0.0
LOCATIONS: TRAVERSE - 6.805 VOLTS	R <sub>2</sub>
RADIAL ( ) : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS	X =
LOCATIONS: TRAVERSE - VOLTS	X <sub>deg</sub>
SCALE : X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	

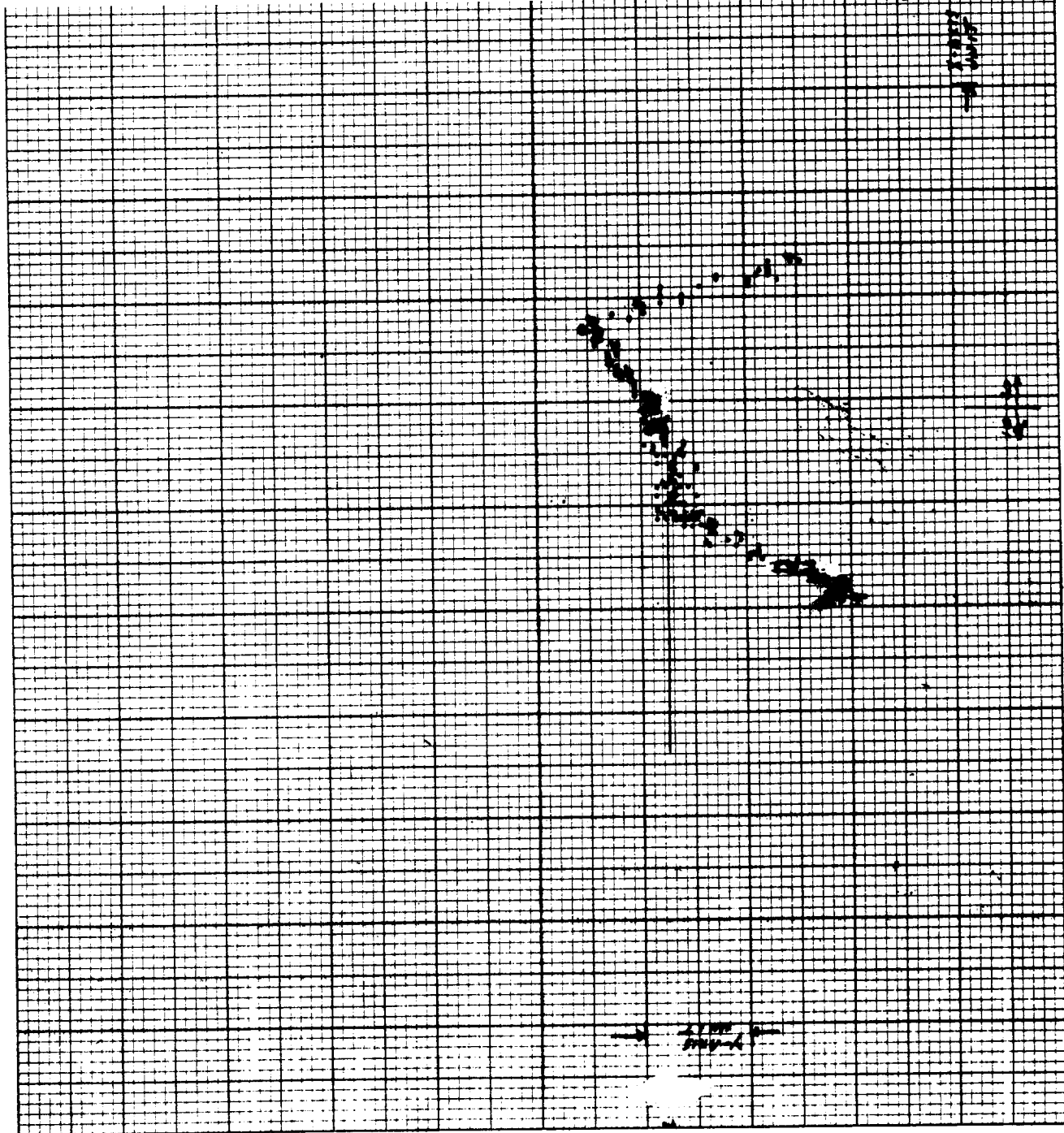
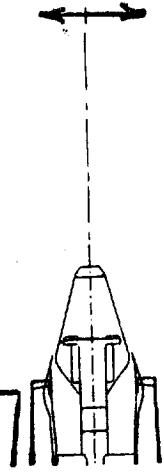


DATE: 6/2/83 NOZZLE: TAS-16  
 TEST POINT: L.V. - 4 ; ACOUSTIC - 1640  
 PLOT IDENTIFICATION: G-133

TRAVERSE DETAILS:  
 AXIAL ☐ : ☐ ; OFFSET - ☐  
 RADIAL REF. (C) - VOLTS R =  
 LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>  
 RADIAL X : E.W. - X ; N.S. - ☐  
 AXIAL REF. (X) - 1.831 VOLTS X = 80  
 LOCATIONS: TRAVERSE - 2.445 VOLTS D = 80  
 SCALE : X-AXIS = 3.317 INCH/UNIT  
 Y-AXIS = 390 F.P.S./UNIT  
 HISTOGRAMS: H-100 TO H-109



DATE: 6/2/83	NOZZLE: TAs-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-134	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS R =
LOCATIONS: TRAVERSE -	LOCATIONS: TRAVERSE -
RADIAL X : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	AXIAL REF. (X-0-1-0-0) VOLTS X = 8.0
LOCATIONS: TRAVERSE - 2.445	LOCATIONS: TRAVERSE - 2.445
SCALE: X-AXIS = 3.317 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
DISTANCE: H- TO H-	



DATE: 6/2/83 NOZZLE: TAS-16

TEST POINT: L.V. - 4 : ACOUSTIC - 1640

PLOT IDENTIFICATION: G - 135°

TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

AXIAL REF. (X=0) - 1.831 VOLTS  $X_{deg}$

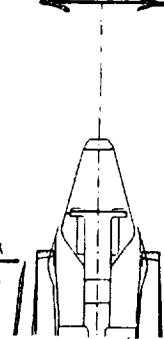
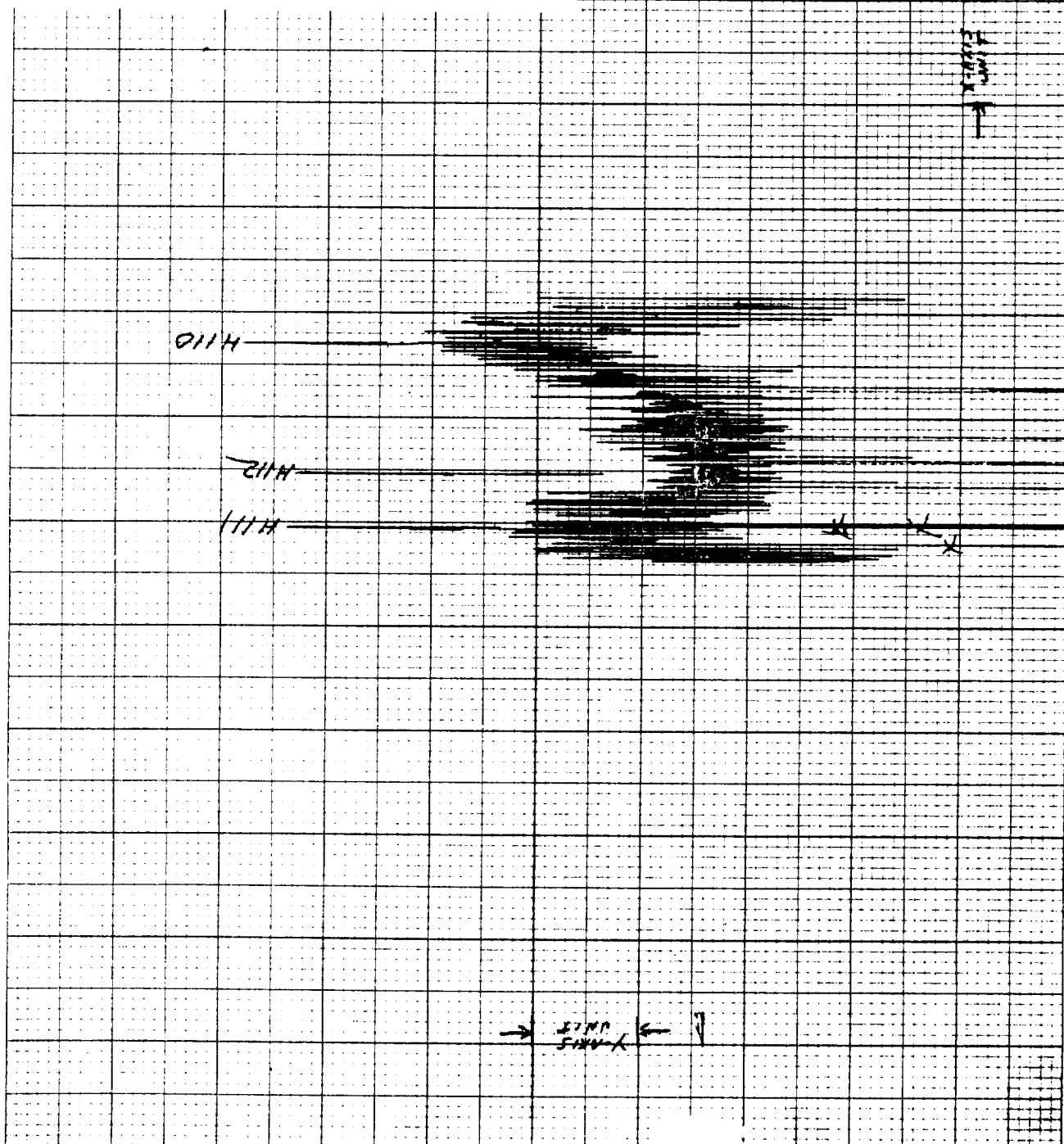
LOCATIONS: TRAVERSE - 2.138 VOLTS  $D_{deg}$

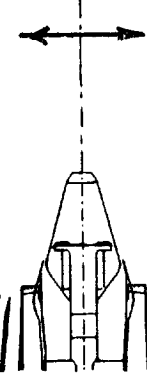
SCALE : X-AXIS = 3317 INCH/UNIT

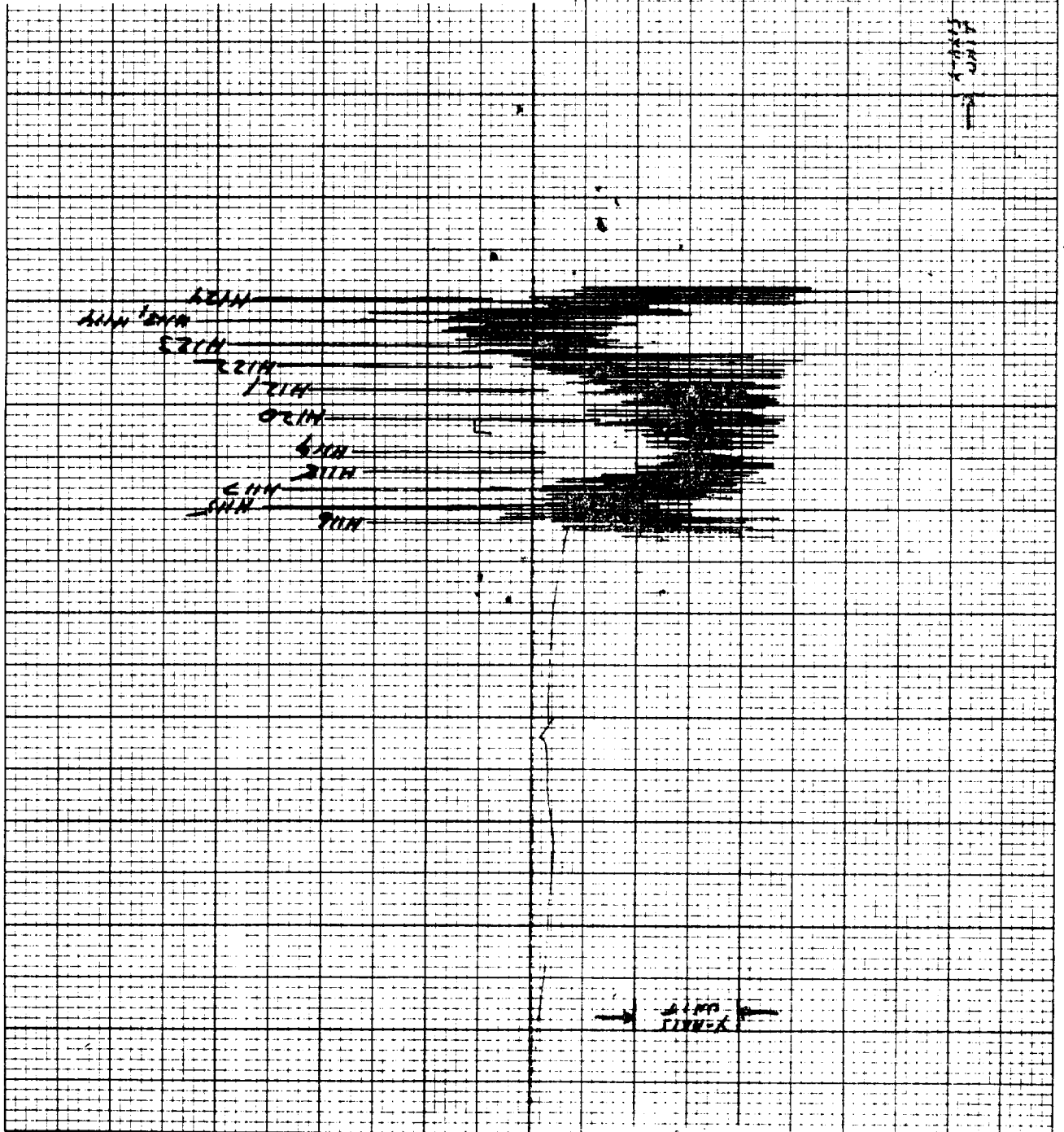
Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-110 TO H-112

X=0

DATE: 6/3/83	NOZZLE: T75-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: 6-139	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	RADIAL <input type="checkbox"/> : <input type="checkbox"/> : VOLTS $R = \frac{V}{2}$
LOCATIONS: TRAVERSE -	RADIAL <input checked="" type="checkbox"/> : E.W. - <input checked="" type="checkbox"/> : N.S. - <input type="checkbox"/>
AXIAL REF. $100-1.83$ VOLTS $X = 4.0$	LOCATIONS: TRAVERSE - $2.138$ VOLTS $Y = 4.0$
SCALE: X-AXIS = 3.817 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H-113 TO H-124	
	



The diagram shows a top-down view of a vehicle's chassis. A dashed vertical line runs through the center, representing the center of gravity. A horizontal line with arrows at both ends is positioned above the vehicle, indicating the direction of travel. The vehicle's frame, including the front and rear axles and suspension components, is outlined.

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—K—  
SINK  
—K—

→ EMP →  
5244-1



DATE: 6/3/83 NOZZLE: TAS-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-141

TRAVERSE DETAILS.

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS  $\frac{R}{R_2}$

LOCATIONS: TRAVERSE -

RADIAL X : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (X-0) - 1.83 VOLTS  $\frac{X}{X_{eq}}$

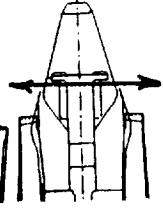
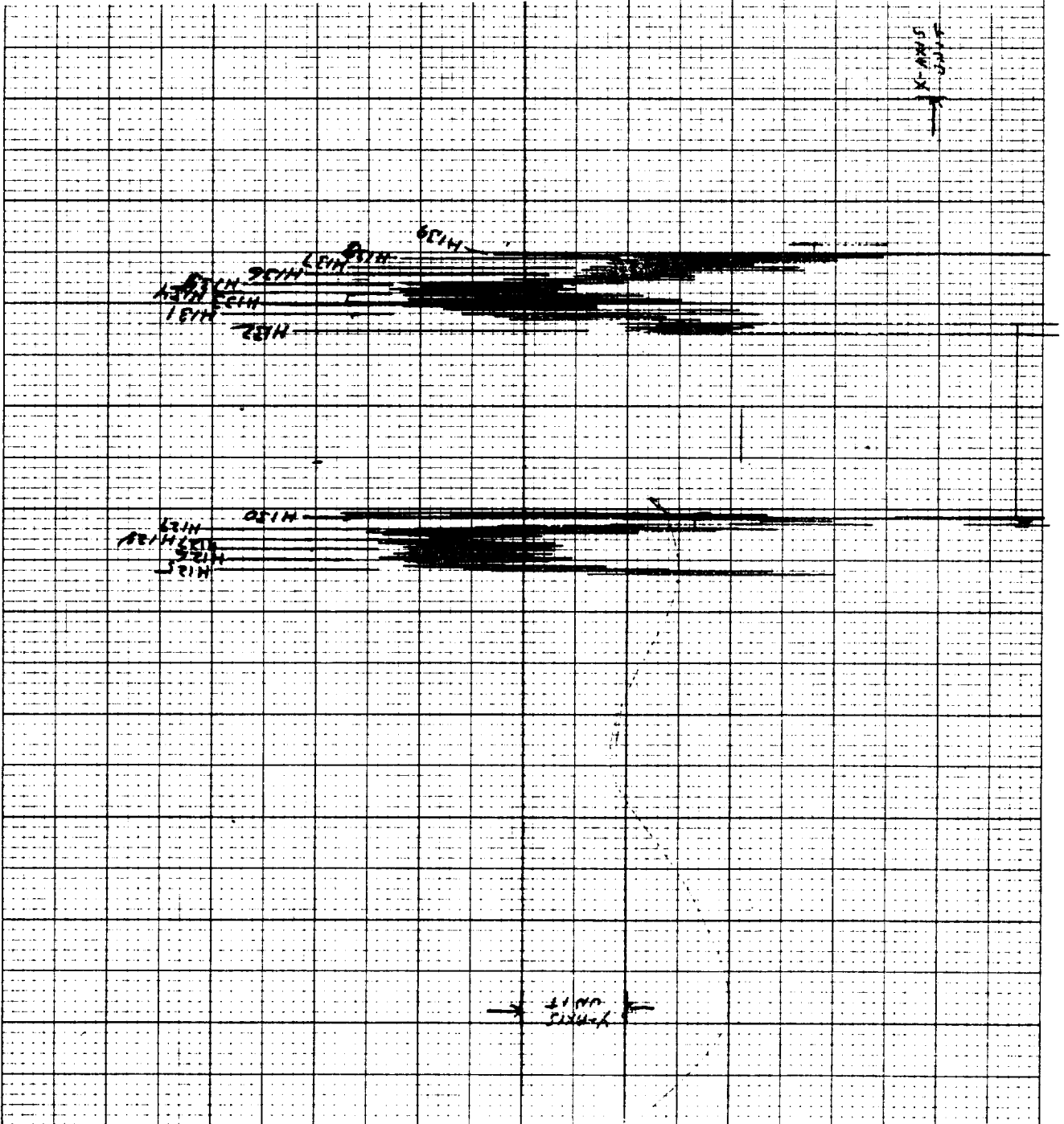
LOCATIONS: TRAVERSE - 1.908 VOLTS

SCALE : X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-125 TO H-139

X=0



DATE: 6/3/83 NOZZLE: JAS-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-142

TRAVERSE DETAILS:

AXIAL ☐ : ☐ - ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐

AXIAL REF. X=0 - 1.83 VOLTS X = 1.0

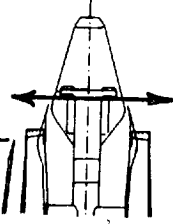
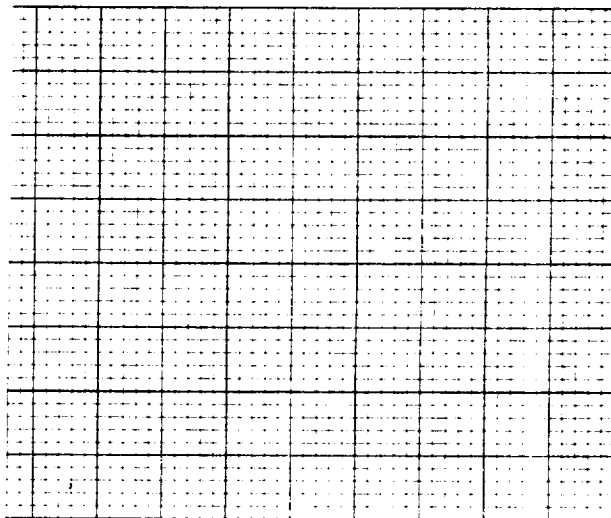
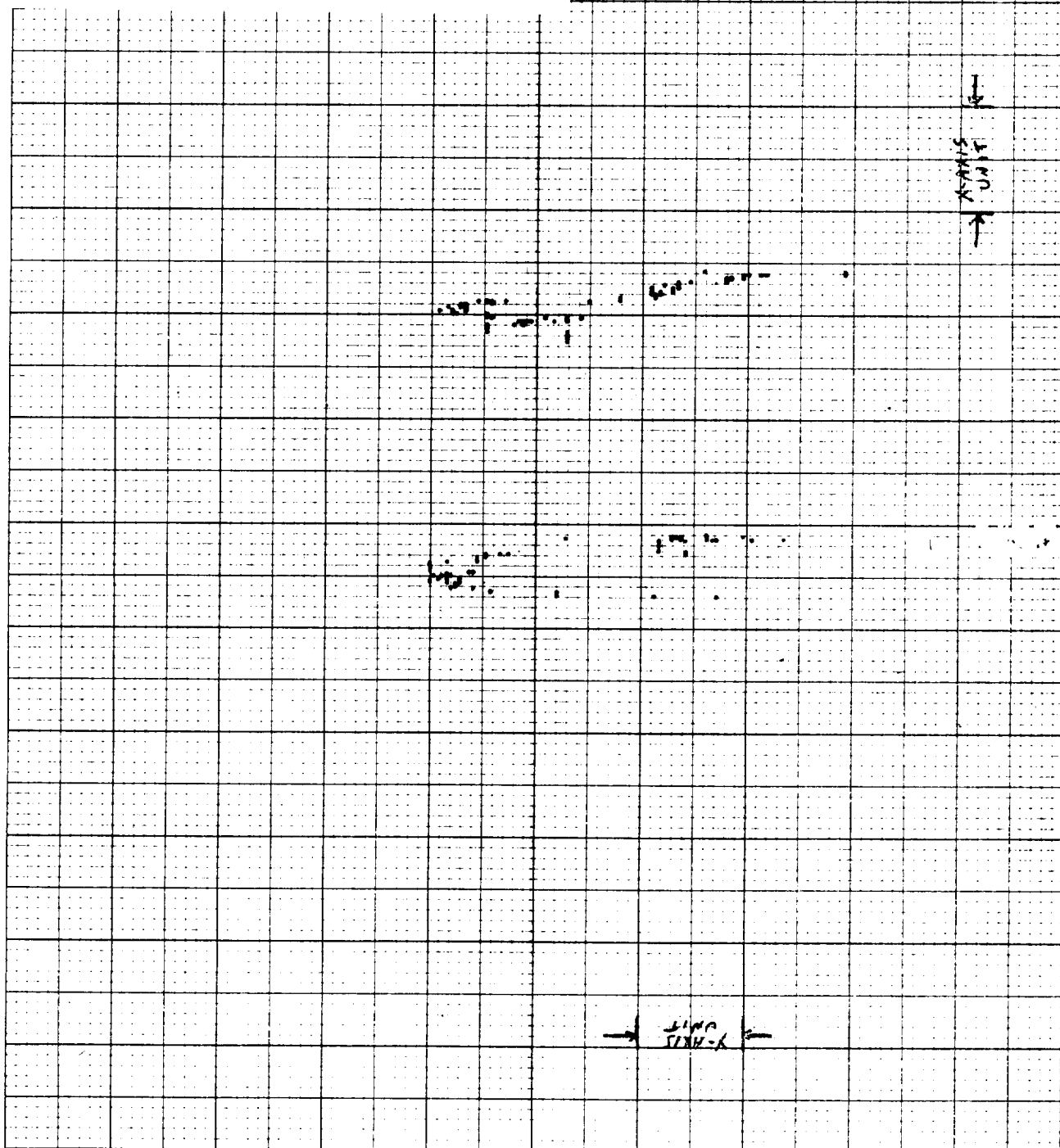
LOCATIONS: TRAVERSE - 1.908 VOLTS D<sub>eq</sub>

SCALE : X-AXIS= 3.317 INCH/UNIT

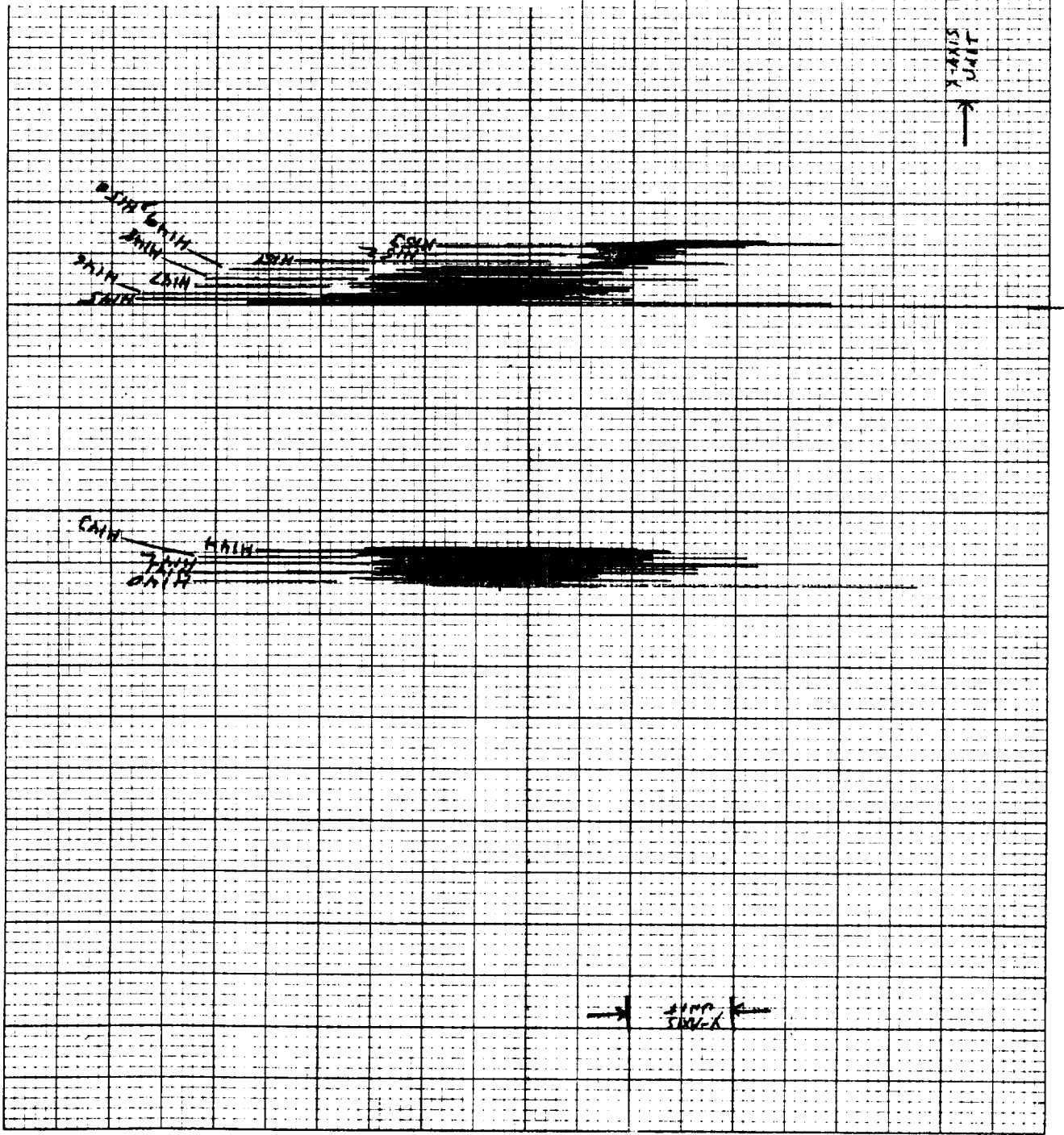
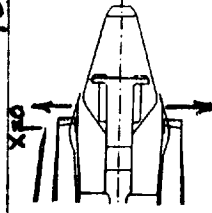
Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

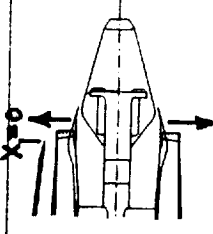
X=0

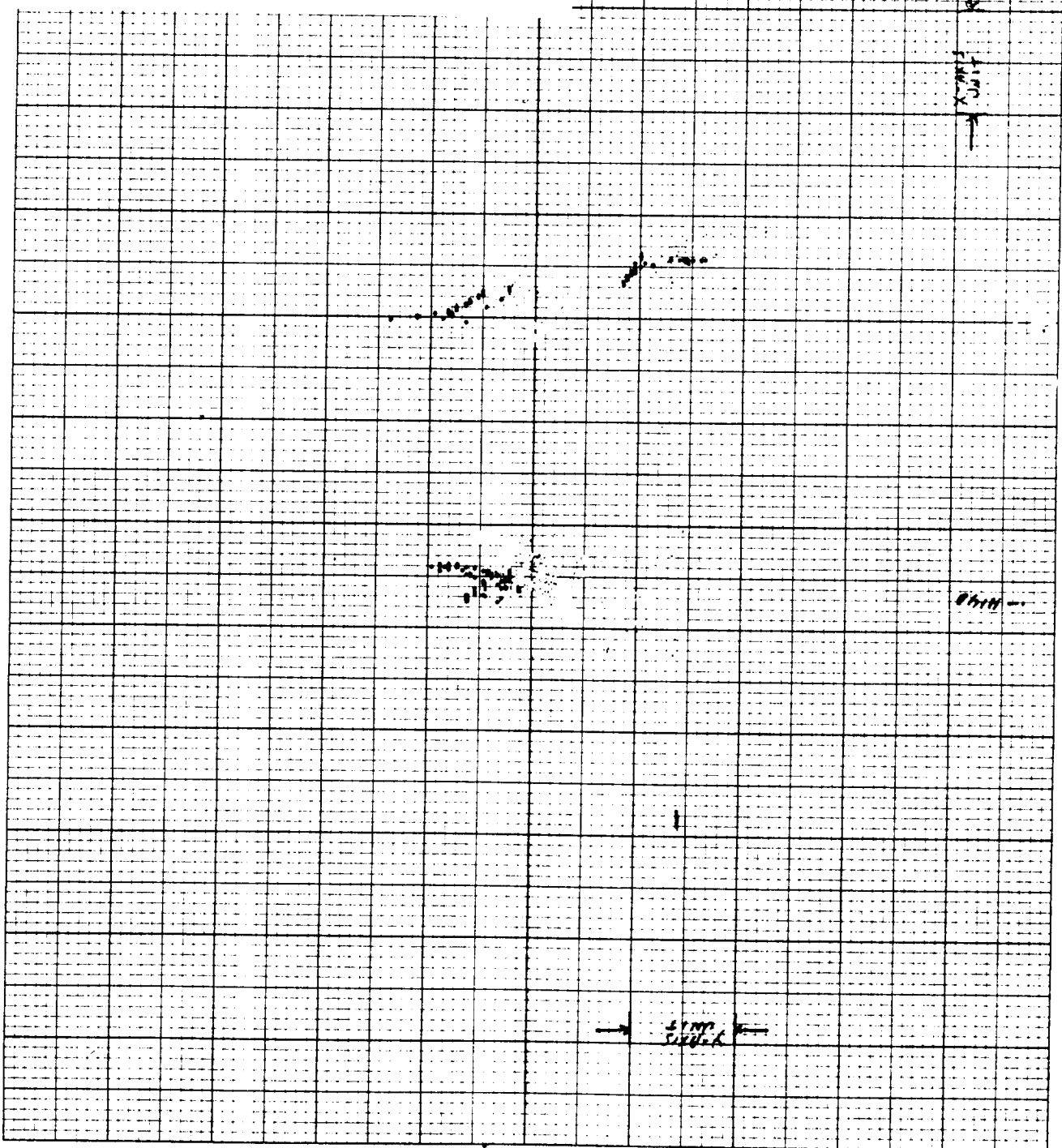
DATE: 6/8/83	NOZZLE: TAS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-143	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> $\phi$ - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. ( $\phi$ ) - VOLTS $\phi_1$
LOCATIONS: TRAVERSE -	VOLTS $\phi_2$
RADIAL $\phi$ : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. 000 - 1.83 VOLTS $\phi$	$\phi = 0.5$
LOCATIONS: TRAVERSE - 1.869 VOLTS $\phi$	eq
SCALE: X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H-140 TO H-153	



DATE: **6/3/83** NOZZLE: **TAS-16**  
 TEST POINT: L.V. - **4** ; ACOUSTIC - **1640**  
 PLOT IDENTIFICATION: **6-144**  
 TRAVERSE DETAILS:  
 AXIAL ☐ : ☒ ; OFFSET - ☐  
 RADIAL REF ( ☒ ) - VOLTS  $R_1$   
 LOCATIONS: TRAVERSE - VOLTS  $R_2$   
 RADIAL ☒ : E.W. - ☒ ; N.S. - ☐  
 AXIAL REF ( ☒ ) VOLTS  $X$   
 LOCATIONS: TRAVERSE - **1.869** VOLTS  $D$  eq  
 SCALE : X-AXIS = **3.317** INCH/UNIT  
 Y-AXIS = **390** F.P.S./UNIT  
 HISTOGRAMS: H- TO H-



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DATE: 6/3/83 NOZZLE: T45-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-145

TRAVERSE DETAILS.

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R =

LOCATIONS: TRAVERSE - VOLTS R<sub>2</sub>

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

AXIAL REF. (000) - 1.83 VOLTS X<sub>D</sub> = 1.50

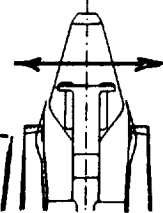
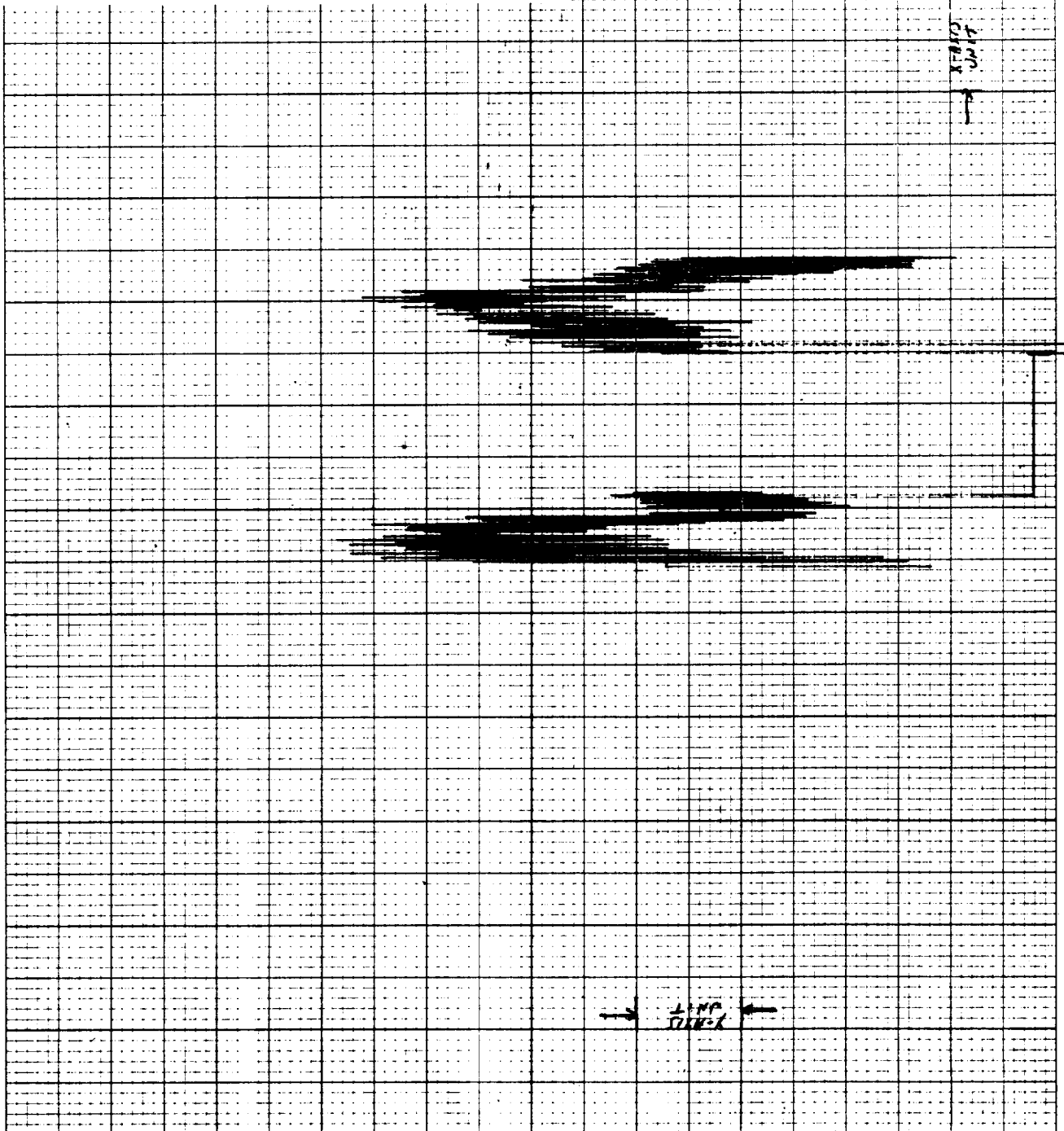
LOCATIONS: TRAVERSE - 1.946 VOLTS D<sub>eq</sub>

SCALE : X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H- TO H-

X=0

DATE: **6/3/83** NOZZLE: **TAS-16**

TEST POINT: L.V. - **4** ; ACOUSTIC - **1640**

PLOT IDENTIFICATION: **G-146**

TRAVERSE DETAILS.

AXIAL ☐ :  $\phi$  - ☐ ; OFFSET - ☐

RADIAL REF. ( $\phi$ ) - VOLTS  $\frac{R}{R}$

LOCATIONS: TRAVERSE - VOLTS  $\frac{R}{R^2}$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐


AXIAL REF. ( $X_{50}$ ) - **1.031** VOLTS  $X_{50}$  = **1.50**

LOCATIONS: TRAVERSE - **1.946** VOLTS  $X_{50}$  = **1.50**

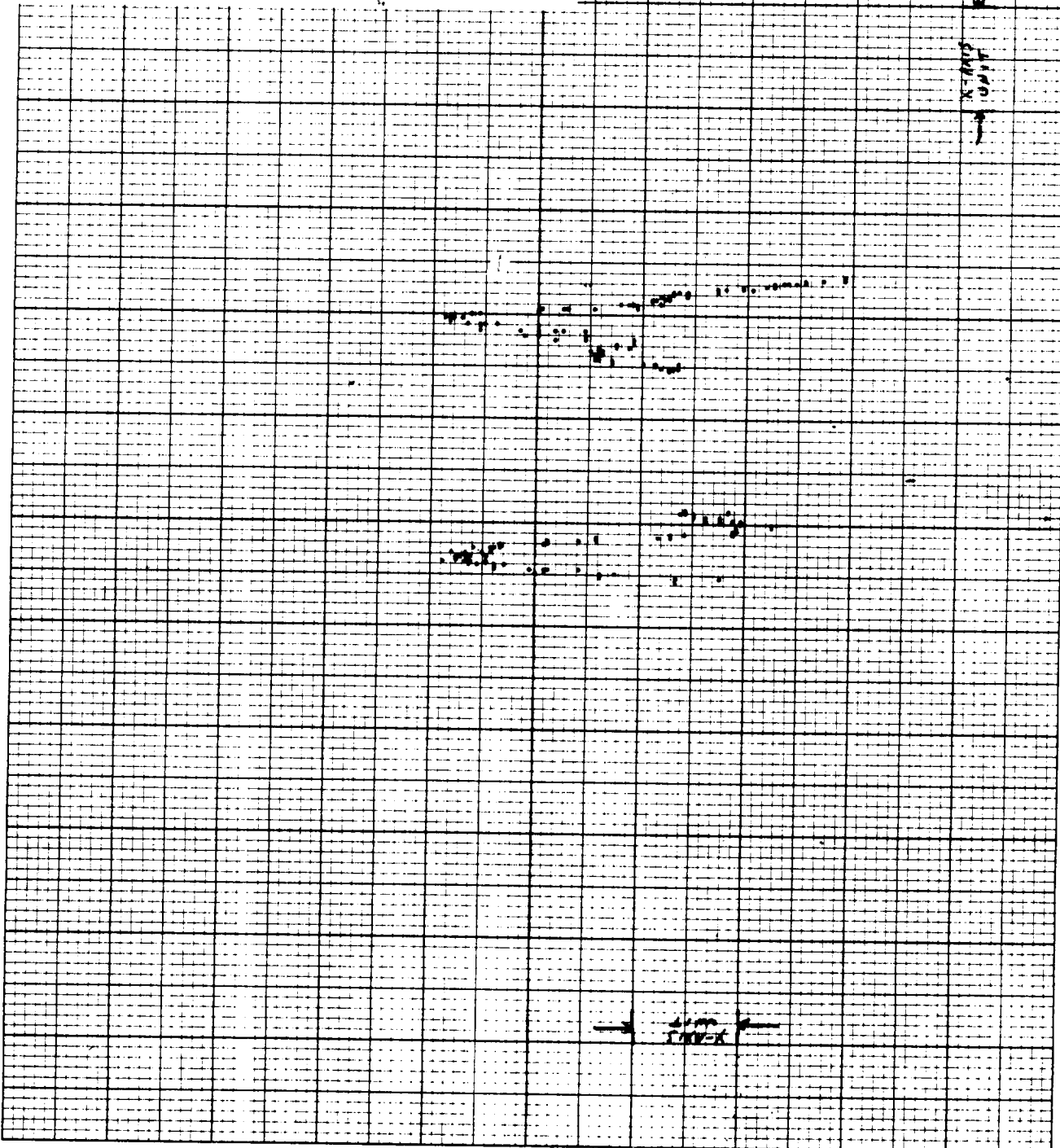
SCALE : X-AXIS = **3.317** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

HISTOGRAMS: H- TO H-



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DATE: 6/3/83 NOZZLE: TAS-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-147

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐


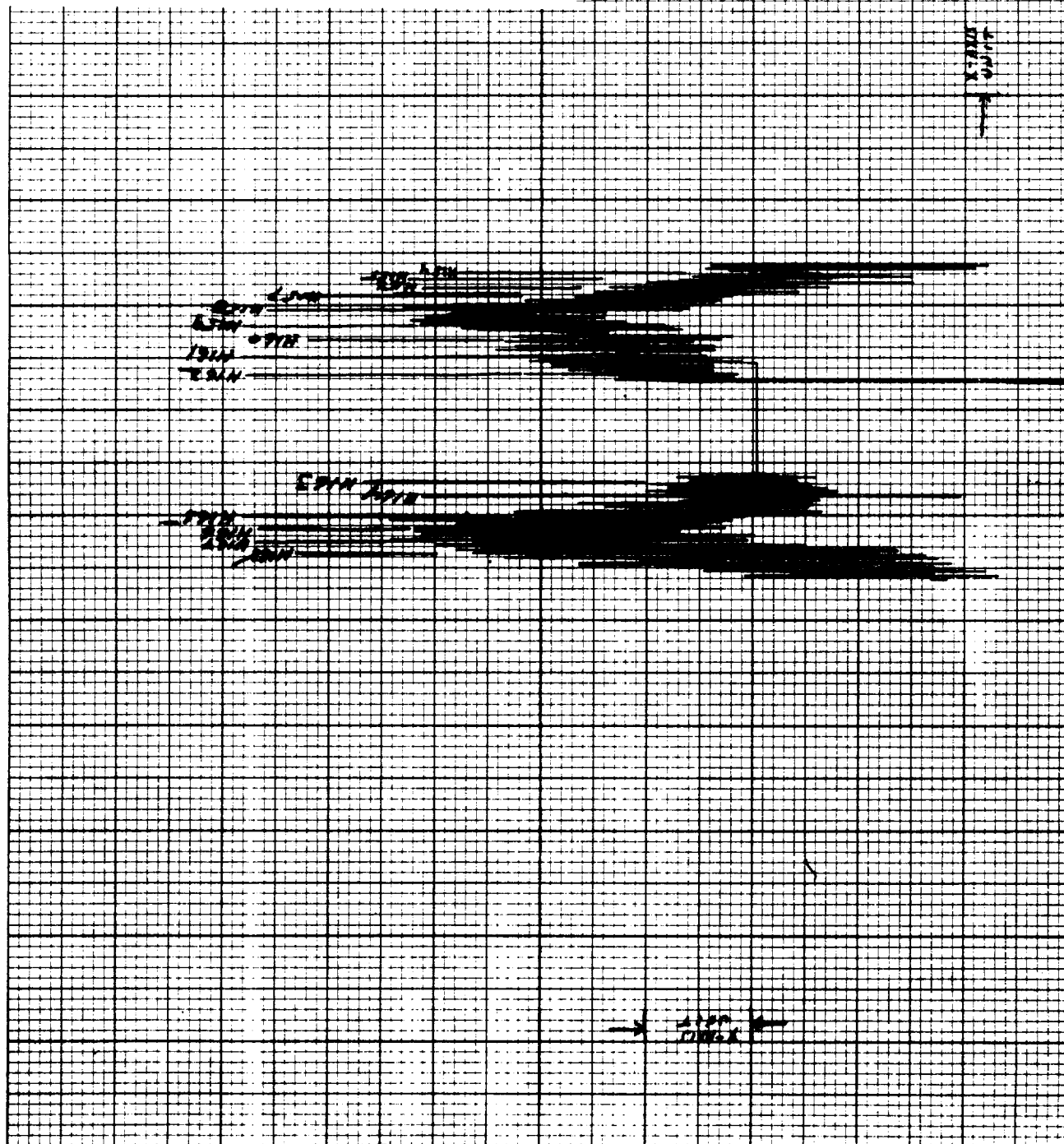
AXIAL REF. (X-00) 1.83 VOLTS X = 2.00

LOCATIONS: TRAVERSE - 1.485 VOLTS D<sub>eq</sub>

SCALE : X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-154 TO H-168

DATE: 6/3/83 NOZZLE: TAs-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-148

TRAVERSE DETAILS:

AXIAL ☐ : ☐ ; OFFSET - ☐

RADIAL REF. (C) - VOLTS R

LOCATIONS: TRAVERSE VOLTS R<sub>2</sub>

RADIAL X : E.W. - ☒ ; N.S. - ☐

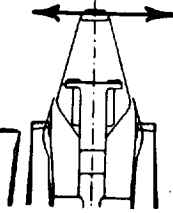
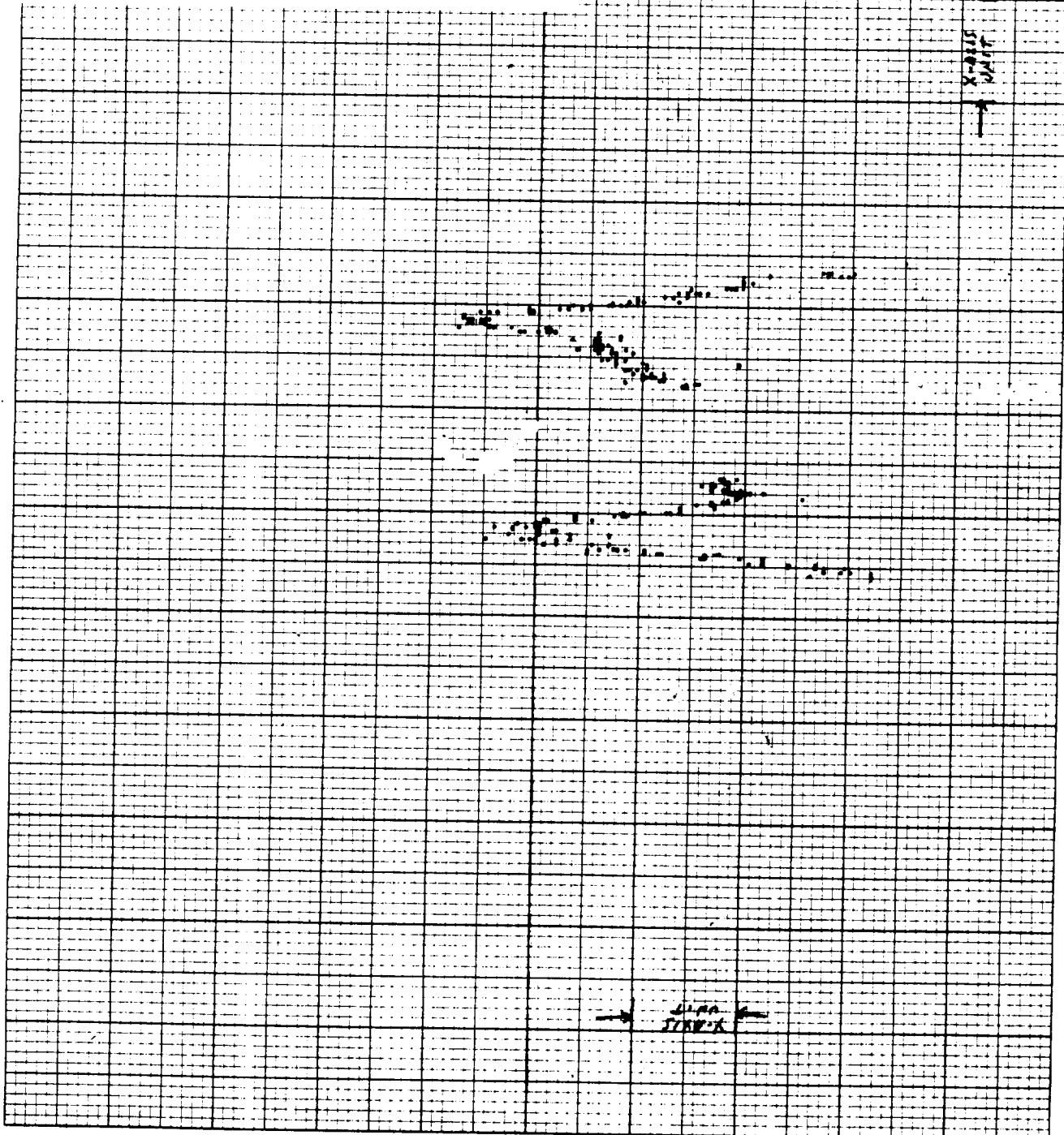
AXIAL REF (X=0) - 1.83 VOLTS X

LOCATIONS: TRAVERSE - 1.985 VOLTS D<sub>eq</sub> = 200

SCALE : X-AXIS = 3.317 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

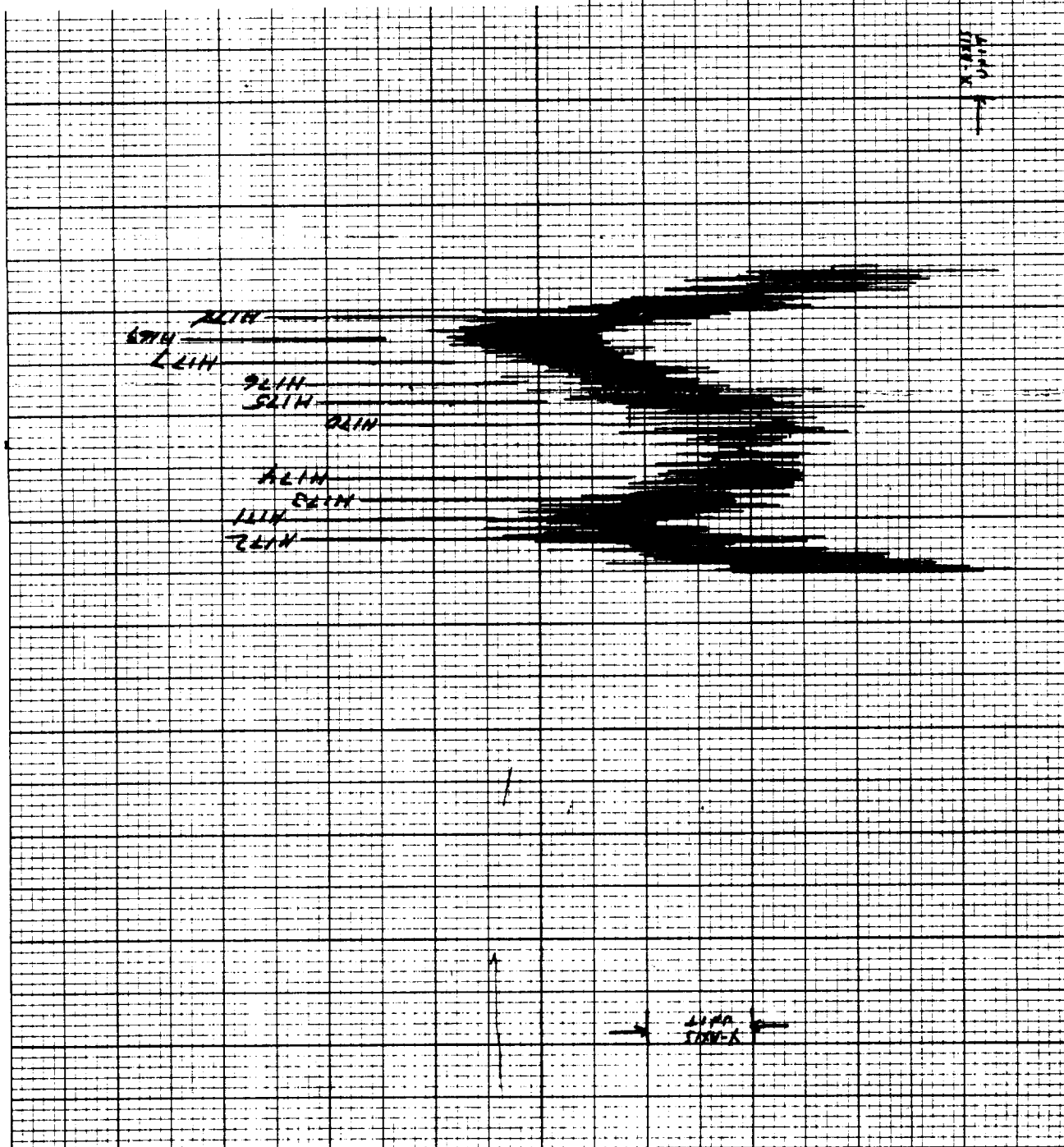
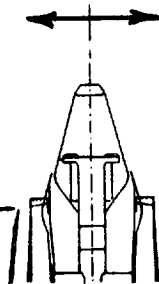
HISTOGRAMS: H- TO H-

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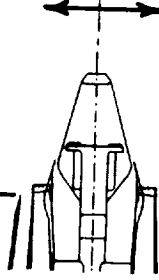


DATE: 6/3/83	NOZZLE: TAS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-149	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> : OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_2$
LOCATIONS: TRAVERSE -	RADIAL X : E.W. - <input checked="" type="checkbox"/> ; N.S. - <input type="checkbox"/>
AXIAL REF (X-0) - 1.831 VOLTS $X_{deg}$	LOCATIONS: TRAVERSE - 2.061 VOLTS
SCALE : X-AXIS = 3.317 INCH/UNIT	Y-AXIS = 390 F.P.S./UNIT
HISTOGRAMS: H-169 TO H-178	

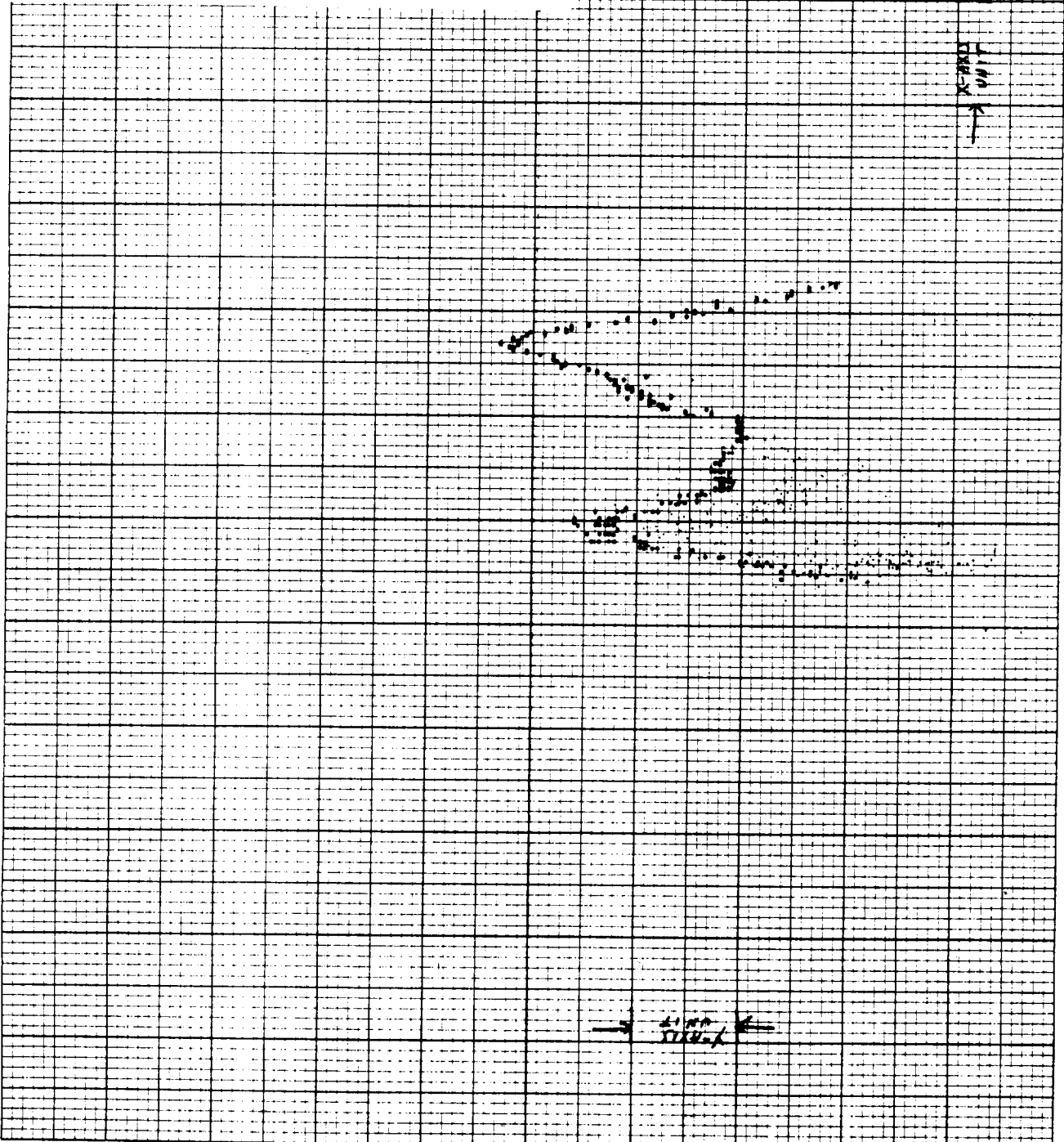




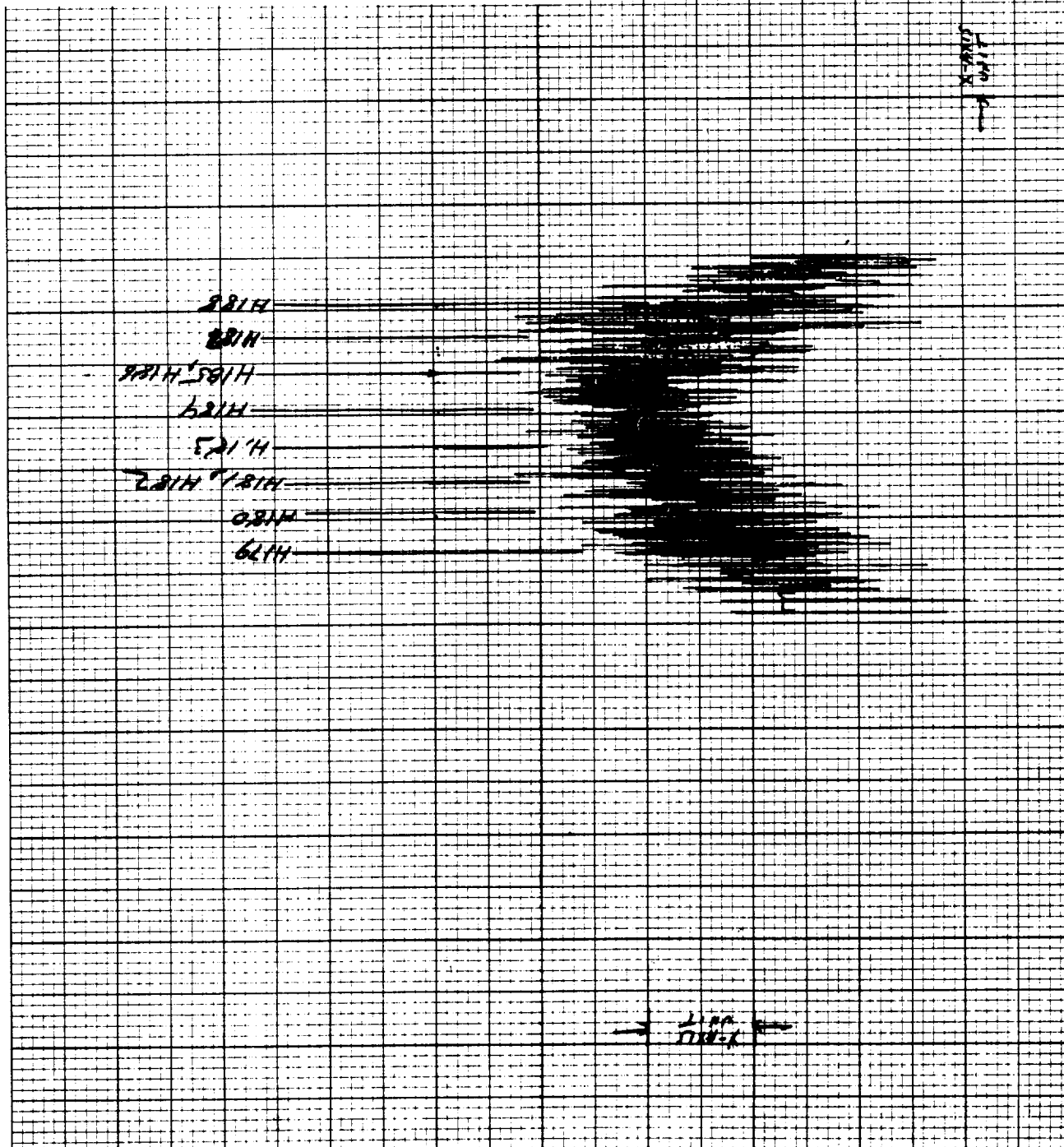
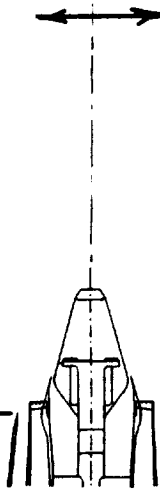
DATE: 6/3/83	NOZZLE: TAS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-150	
TRAVERSE DETAILS:	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	RADIAL REF. (C) - VOLTS $R_1$
LOCATIONS: TRAVERSE - VOLTS $R_2$	RADIAL $R_1$ : E.W. - $R_2$ ; N.S. - <input type="checkbox"/>
AXIAL LOCATIONS: REF. (X=0) 1.831 VOLTS $X$ 3.00	TRAVERSE 2.061 VOLTS $D$ eq
SCALE : X-AXIS=3.317 INCH/UNIT	Y-AXIS=390 F.P.S./UNIT
HISTOGRAMS: H- TO H-	



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DATE: 6/3/83	NOZZLE: T45-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-15-3	
TRAVERSE DETAILS.	
AXIAL <input type="checkbox"/> : <input type="checkbox"/> - <input type="checkbox"/> ; OFFSET - <input type="checkbox"/>	
RADIAL REF. (C) - VOLTS R	
LOCATIONS: TRAVERSE - VOLTS R <sub>2</sub>	
RADIAL X : E.W. - 10 ; N.S. - <input type="checkbox"/>	
AXIAL REF. (X-0) - 1.83 VOLTS X	
LOCATIONS: TRAVERSE - 2.600 VOLTS D <sub>eq</sub>	
SCALE : X-AXIS = 3.317 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H-179 TO H-188	



DATE: **6/3/83** NOZZLE: **TAS-16**

TEST POINT: L.V. - **4** ; ACOUSTIC - **1640**

PLOT IDENTIFICATION: **G-154**

TRAVERSE DETAILS.

AXIAL ☐ : ☒ ; OFFSET - ☐

RADIAL REF. ( ☒ ) - VOLTS  $R_1$

LOCATIONS: TRAVERSE - VOLTS  $R_2$

RADIAL ☒ : E.W. - ☒ ; N.S. - ☐

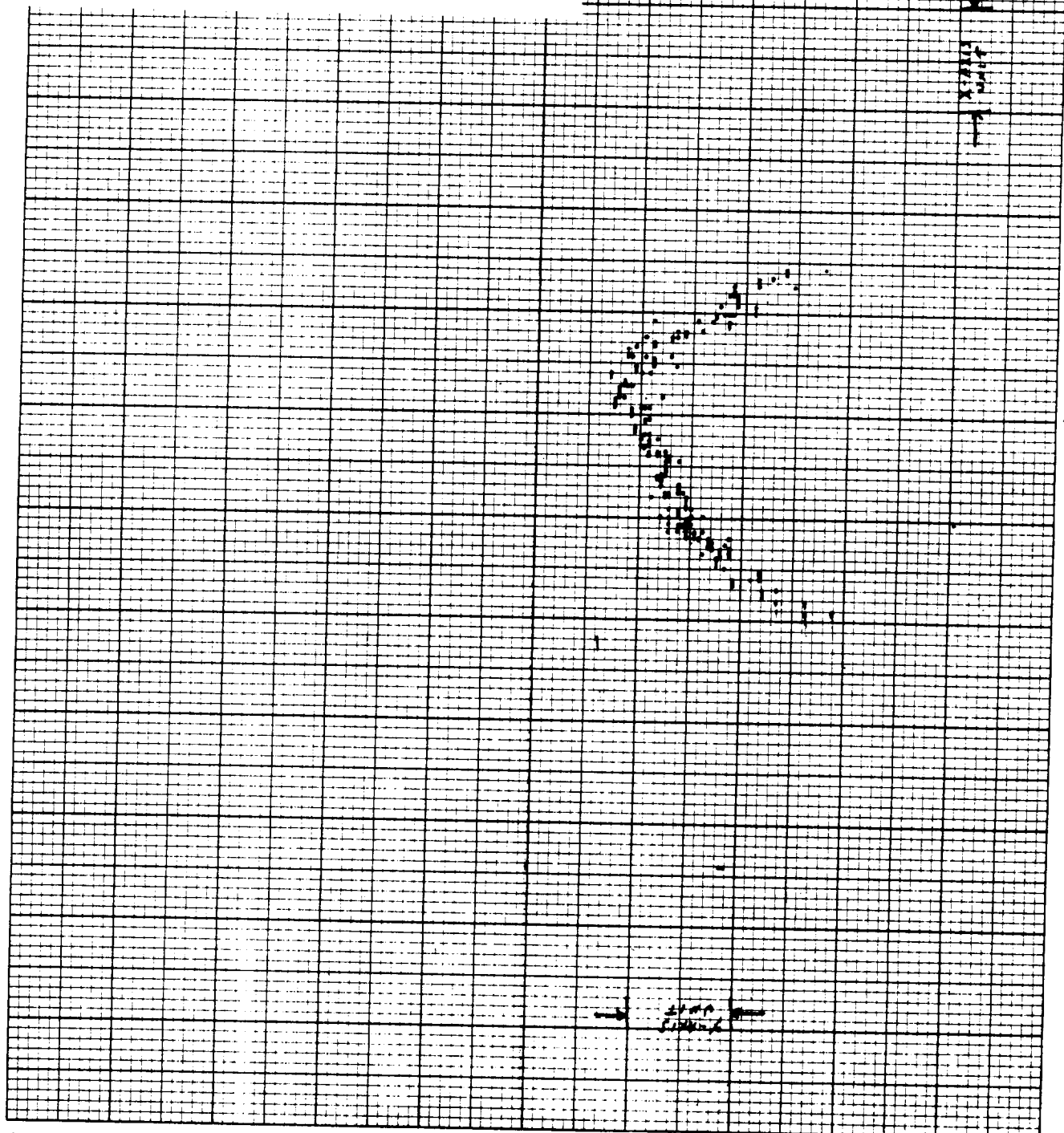
AXIAL REF. ( ☒ ) VOLTS  $X_{eq}$

LOCATIONS: TRAVERSE - **2-600** VOLTS  $D_{eq}$

SCALE : X-AXIS = **3.317** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

HISTOGRAMS: ☒ H- TO H-



DATE: 6/3/83 NOZZLE: TAS-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-155

TRAVERSE DETAILS:

AXIAL ☒ ; OFFSET - ☒ X

RADIAL REF. (C) - 6.820 VOLTS R - 1745

LOCATIONS: TRAVERSE - 2.24 VOLTS R<sub>2</sub>

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

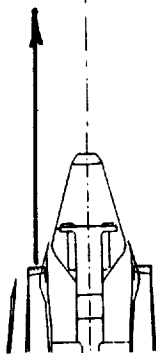
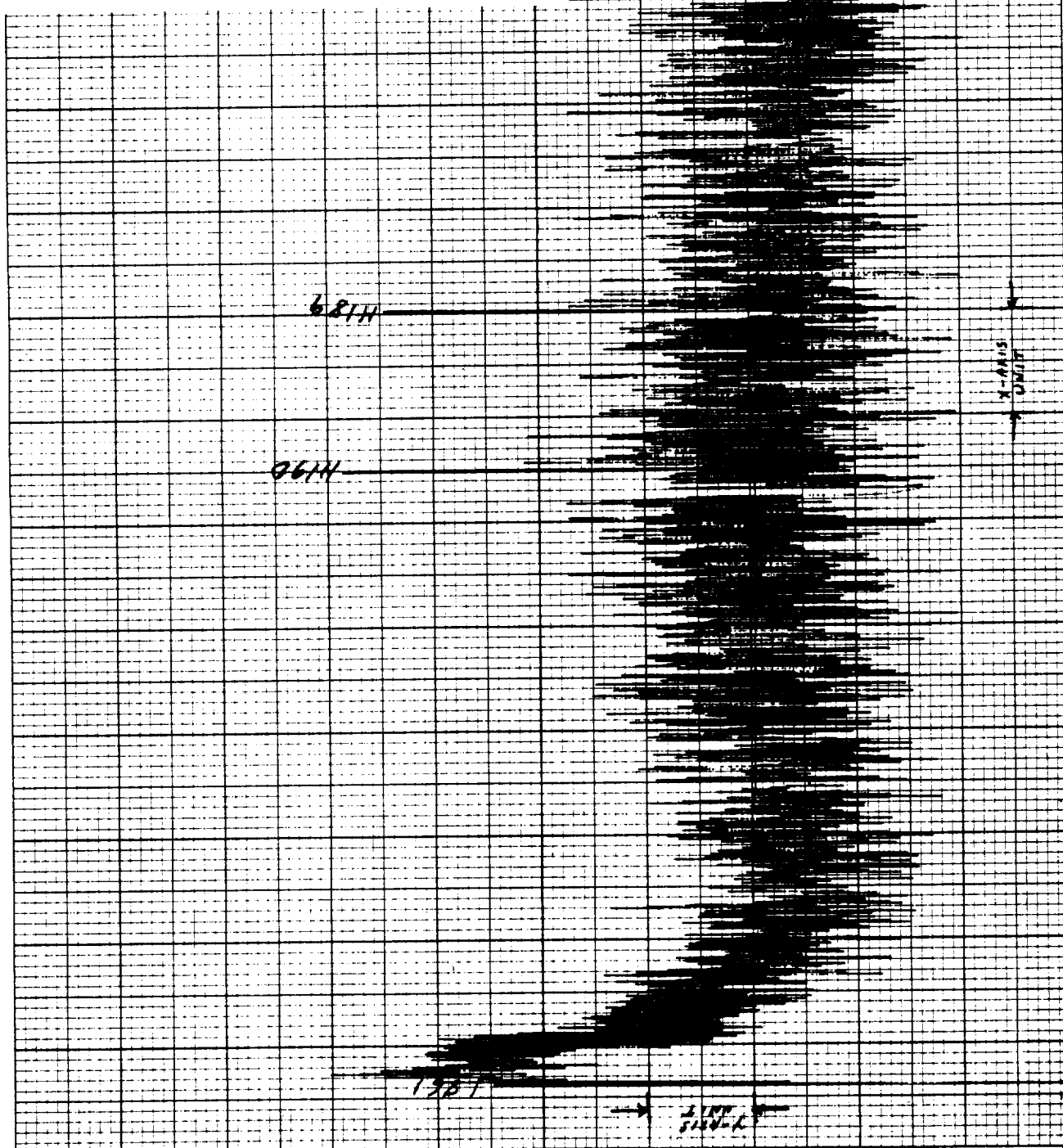
AXIAL REF. ( ) - VOLTS X

LOCATIONS: TRAVERSE - VOLTS <sub>eq</sub>

SCALE : X-AXIS = 7.20 INCH/UNIT

Y-AXIS = 390 F.P.S./UNIT

HISTOGRAMS: H-189 TO H-190

DATE: **6/3/83** NOZZLE: **TAS-14**

TEST POINT: L.V. - **4** ; ACOUSTIC - **1640**

PLOT IDENTIFICATION: G - **156**

TRAVERSE DETAILS.

AXIAL ☒ :  $\phi$  - ☐ ; OFFSET - ☒  $\times$

RADIAL REF. (  $\phi$  ) - **6.820** VOLTS  $R_2$  - **745**

LOCATIONS: TRAVERSE - **8.231** VOLTS  $R_2$

RADIAL ☐ : E.W. - ☐ ; N.S. - ☐

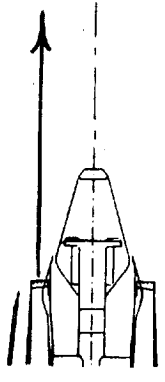
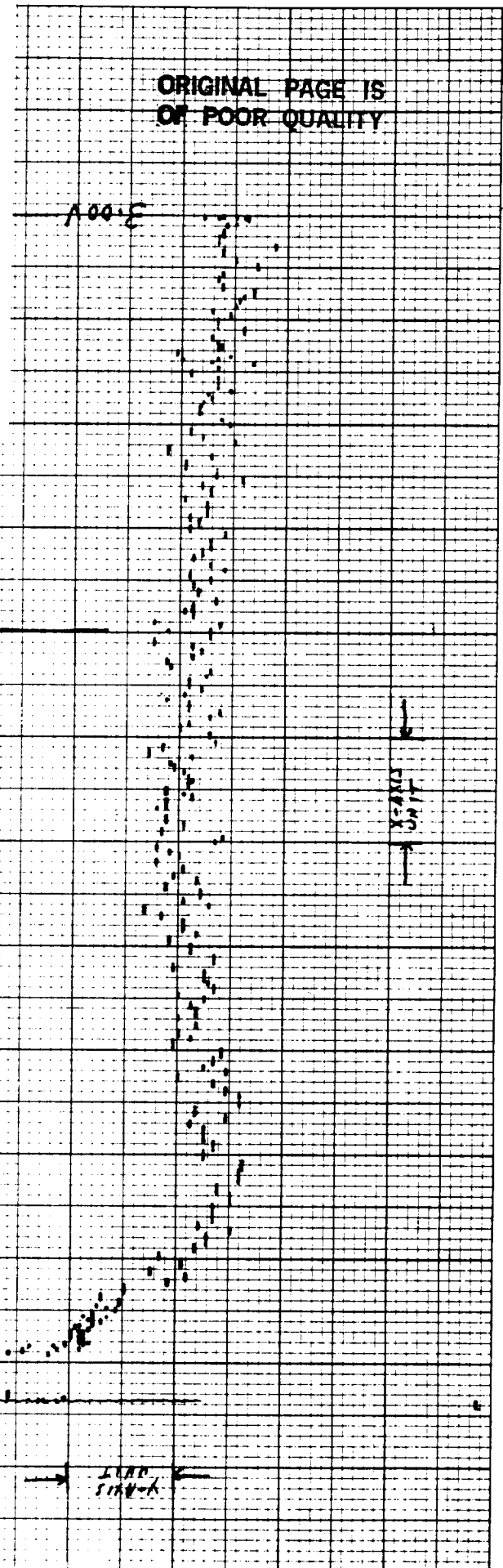
AXIAL REF. ( ) - VOLTS  $X$

LOCATIONS: TRAVERSE - VOLTS  $D_{eq}$

SCALE : X-AXIS = **7.20** INCH/UNIT

Y-AXIS = **390** F.P.S./UNIT

HISTOGRAMS: H- TO H-

DATE: **6/3/83** NOZZLE: **TAS-16**

TEST POINT: L.V. - ; ACOUSTIC - **1640**

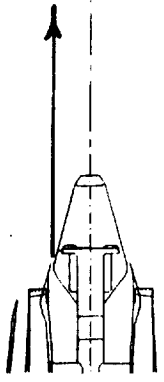
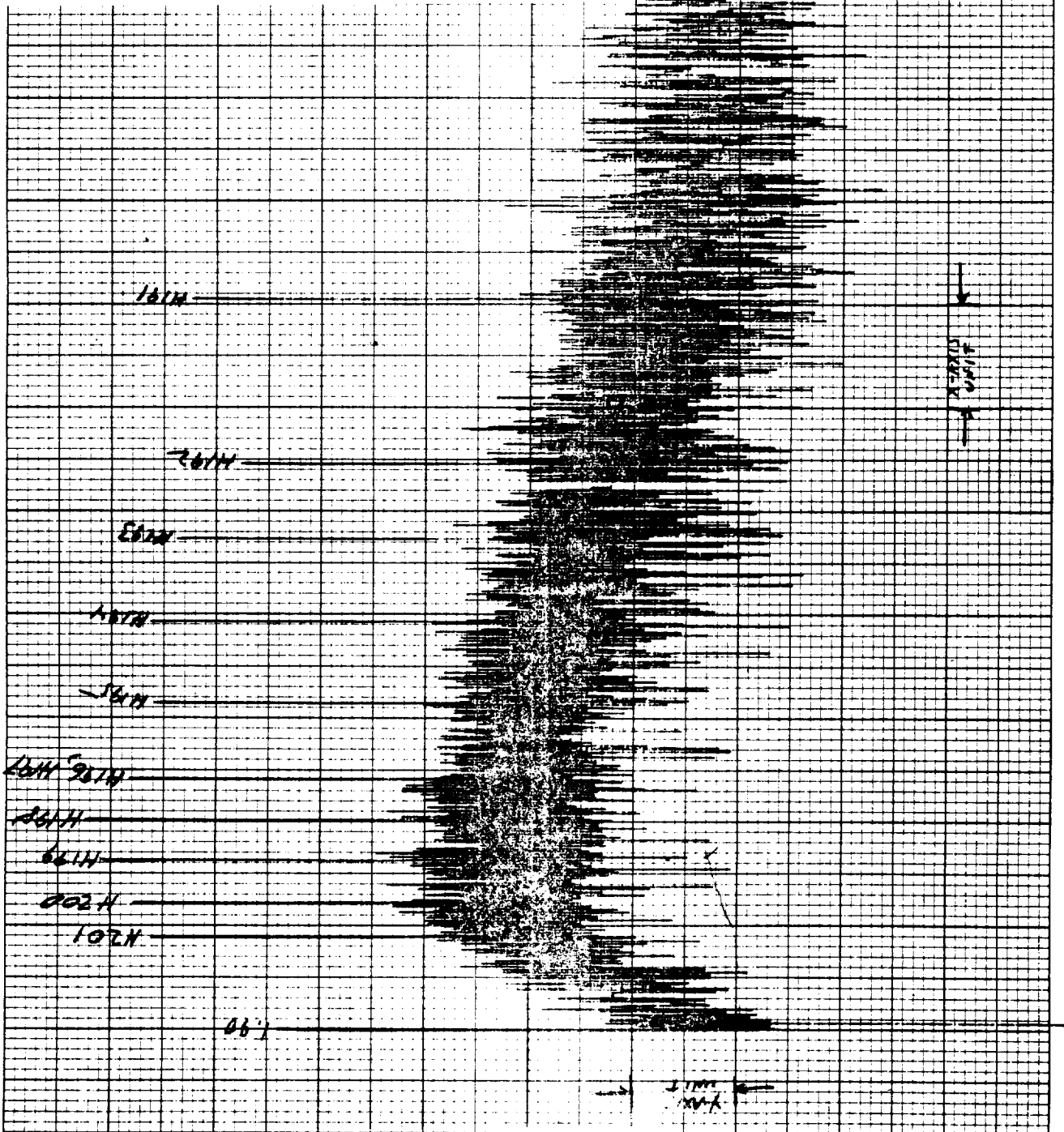
PLOT IDENTIFICATION: **G-157**

TRAVERSE DETAILS.

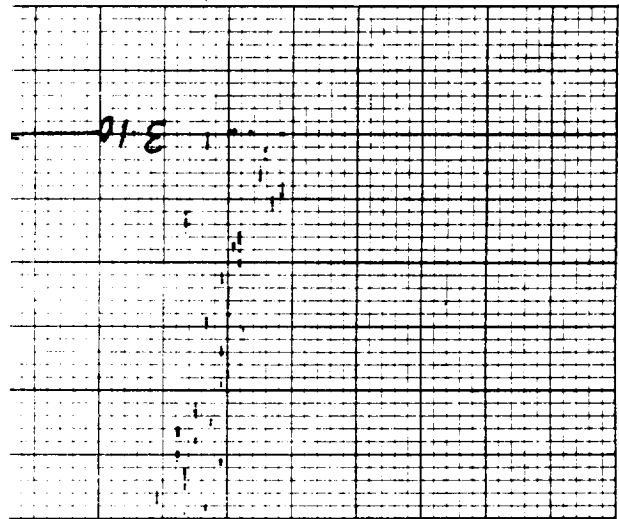
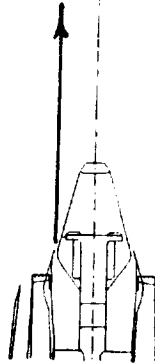
AXIAL ☒ : ☐ ; OFFSET - ☒  
 RADIAL REF. ( ) - **6820** VOLTS) R = **50**  
 LOCATIONS: TRAVERSE - **7.762** VOLTS)  $\frac{X}{D_{eq}}$   
 RADIAL : E.W. - ☐ ; N.S. - ☐  
 AXIAL REF. ( ) - VOLTS)  $\frac{X}{D_{eq}}$   
 LOCATIONS: TRAVERSE - VOLTS)  $\frac{X}{D_{eq}}$

SCALE : X-AXIS = **7.20** INCH/UNIT  
 Y-AXIS = **390** F.P.S./UNIT

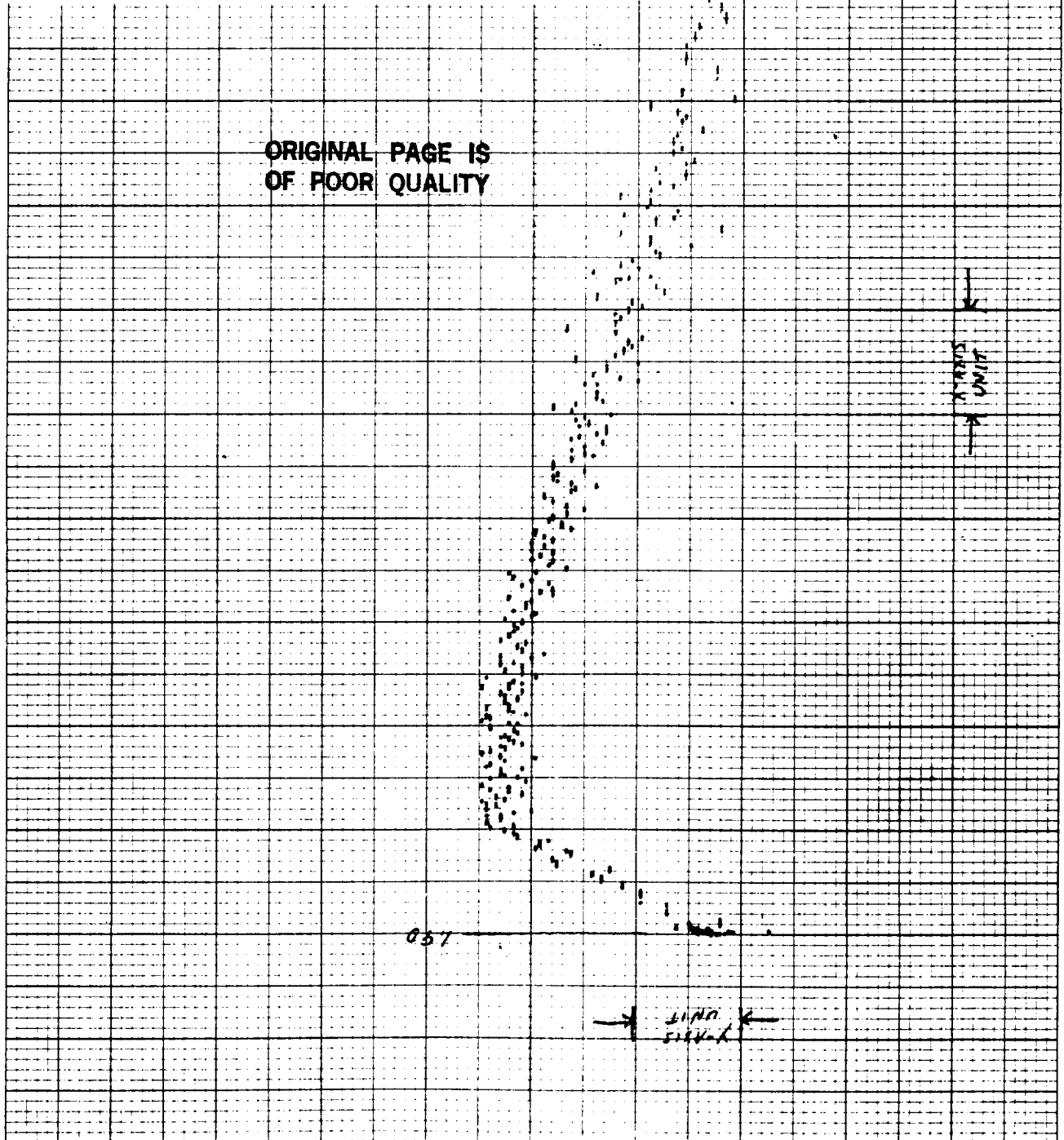
HISTOGRAMS: H-191 TO H-201

DATE: 6/3/83	NOZZLE: THS-16
TEST POINT: L.V. -	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-158	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> ; <input type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. (C) - 6.820 VOLTS	R <sub>1</sub> = .50
LOCATIONS: TRAVERSE - 7.762 VOLTS	R <sub>2</sub>
RADIAL <input type="checkbox"/> ; E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) -	VOLTS X =
LOCATIONS: TRAVERSE -	VOLTS D =
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



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LINE 1  
SILENCE

LINE 1  
SILENCE



DATE: 6/3/83 NOZZLE: TAs-16

TEST POINT: L.V. - 4 ; ACOUSTIC - 1640

PLOT IDENTIFICATION: G-159

TRAVERSE DETAILS:

AXIAL ☒ ; ☐ ; OFFSET - 0

RADIAL REF. (C) - 6.820 VOLTS  $R_2 = 0.570$

LOCATIONS: TRAVERSE - 5.883 VOLTS  $R_2$

RADIAL ☐ ; E.W. - ☐ ; N.S. - ☐

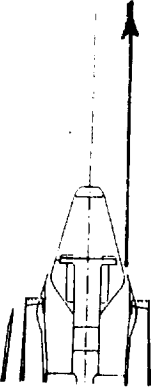
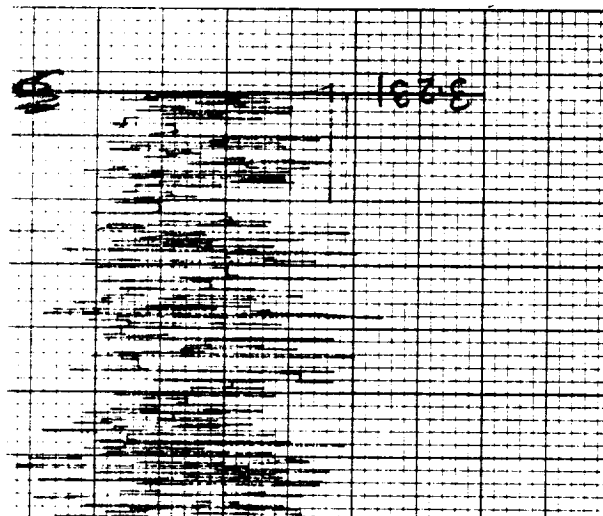
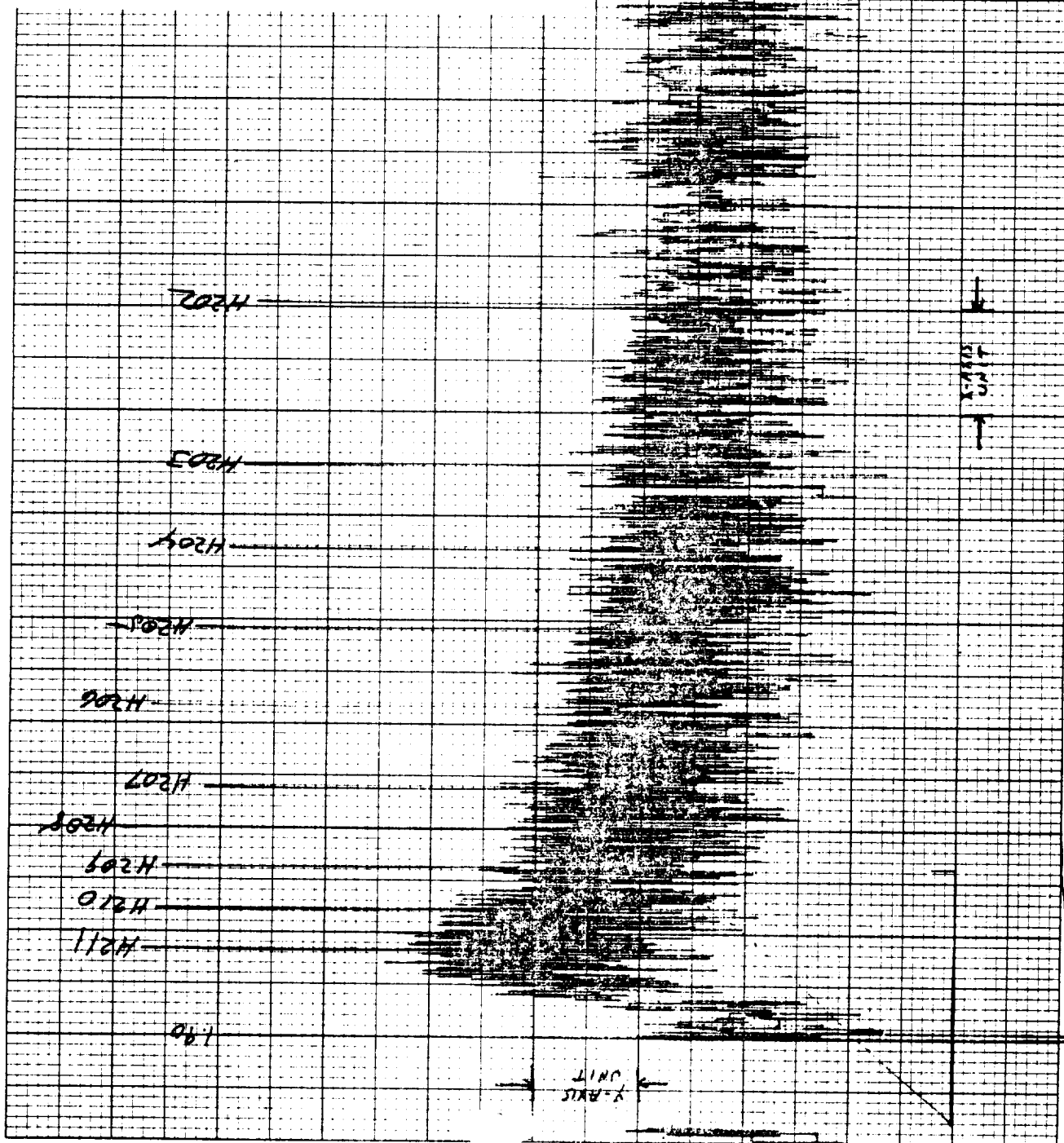
AXIAL REF. ( ) - VOLTS  $X =$

LOCATIONS: TRAVERSE - VOLTS  $D =$  eq

SCALE: X-AXIS= 7.20 INCH/UNIT

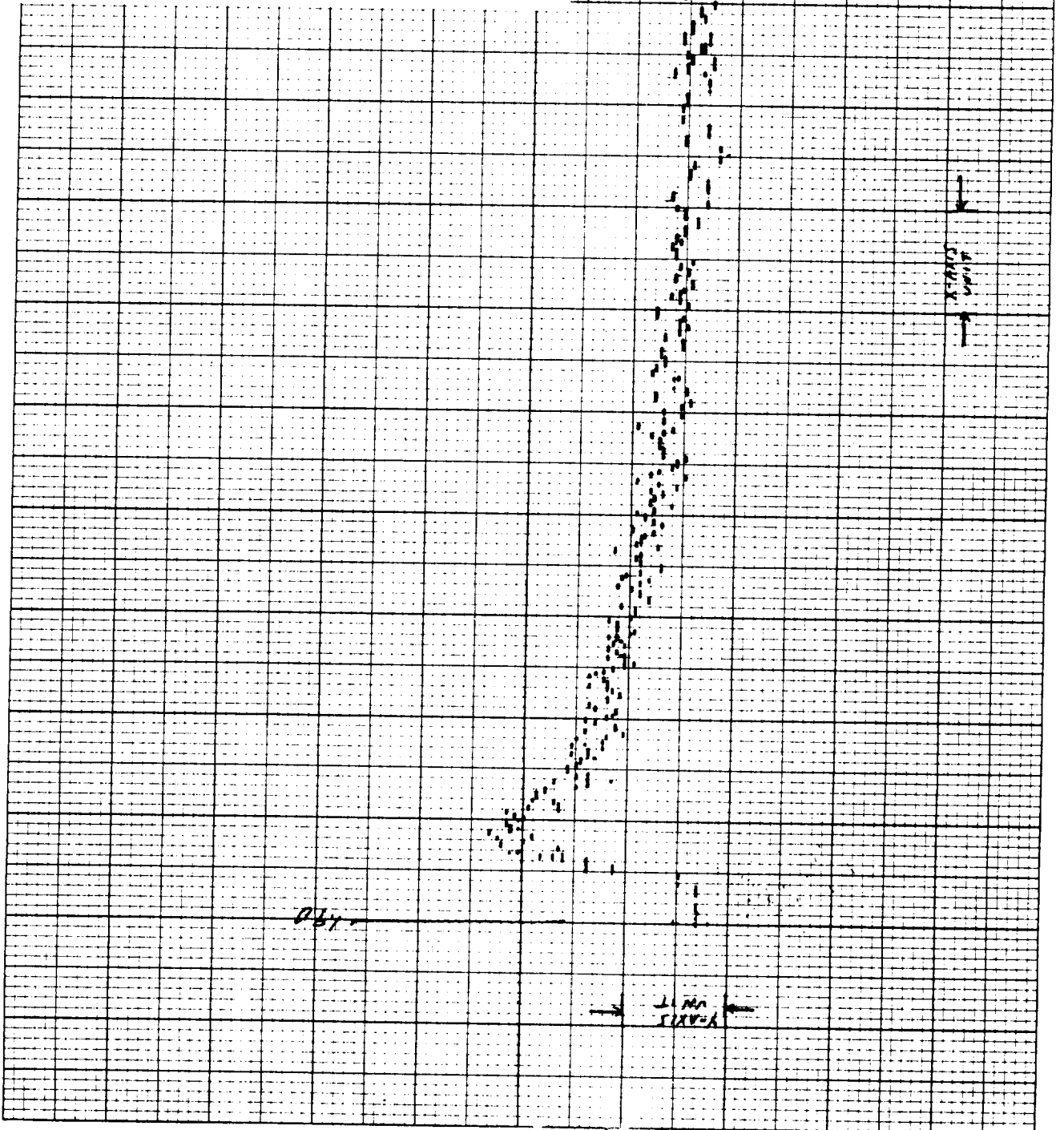
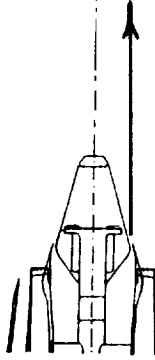
Y-AXIS= 390 F.P.S./UNIT

HISTOGRAMS: H- 201 TO H-211

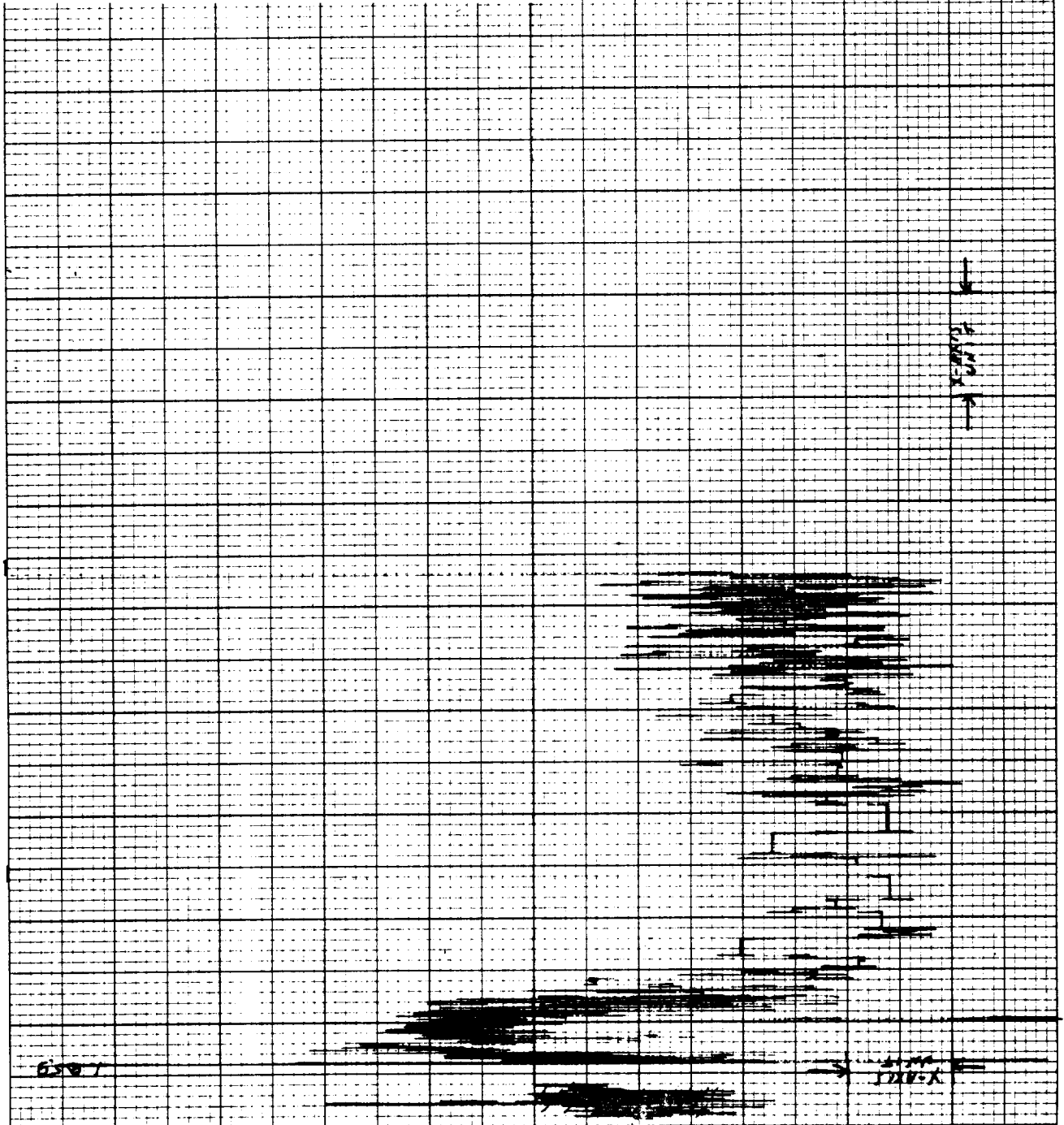
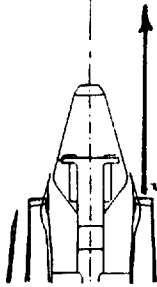





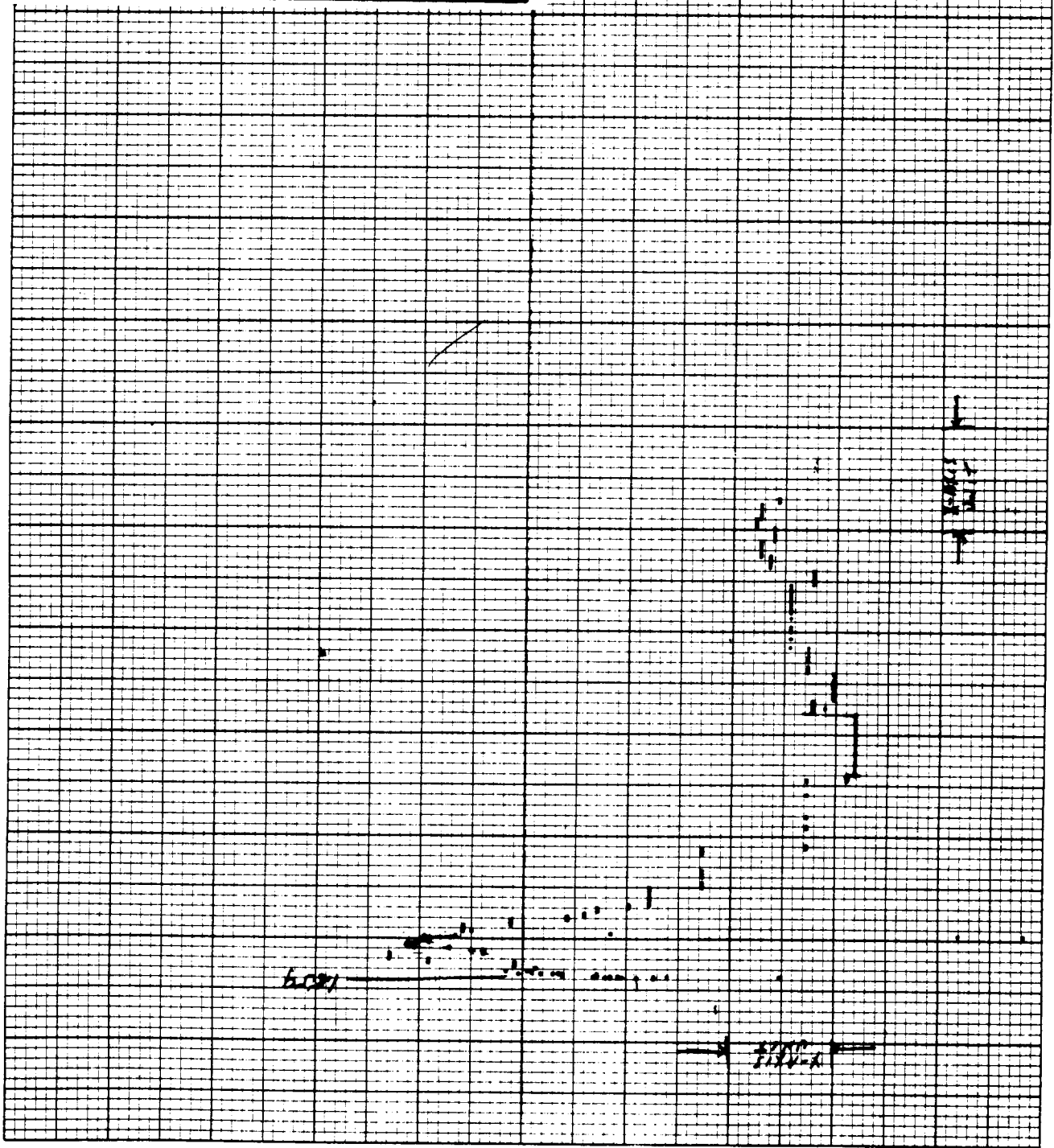
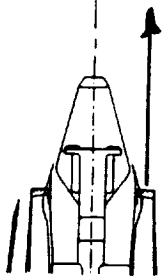
DATE: <b>6/3/83</b>	NOZZLE: <b>JAS-16</b>
TEST POINT: <b>L.V. - 4</b>	ACOUSTIC - <b>1640</b>
PLOT IDENTIFICATION: <b>G-160</b>	
TRAVERSE DETAILS:	
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RADIAL REF. ( <input checked="" type="checkbox"/> ) - <b>6.820</b> VOLTS	R - <b>0.50</b>
LOCATIONS: TRAVERSE - <b>5.883</b> VOLTS	$R_{eq}^2$
RADIAL <input type="checkbox"/> : E.W. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( <input type="checkbox"/> ) - VOLTS	$X_{eq}$
LOCATIONS: TRAVERSE - VOLTS	$Y_{eq}$
SCALE: X-AXIS = <b>7.20</b> INCH/UNIT	
Y-AXIS = <b>390</b> F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



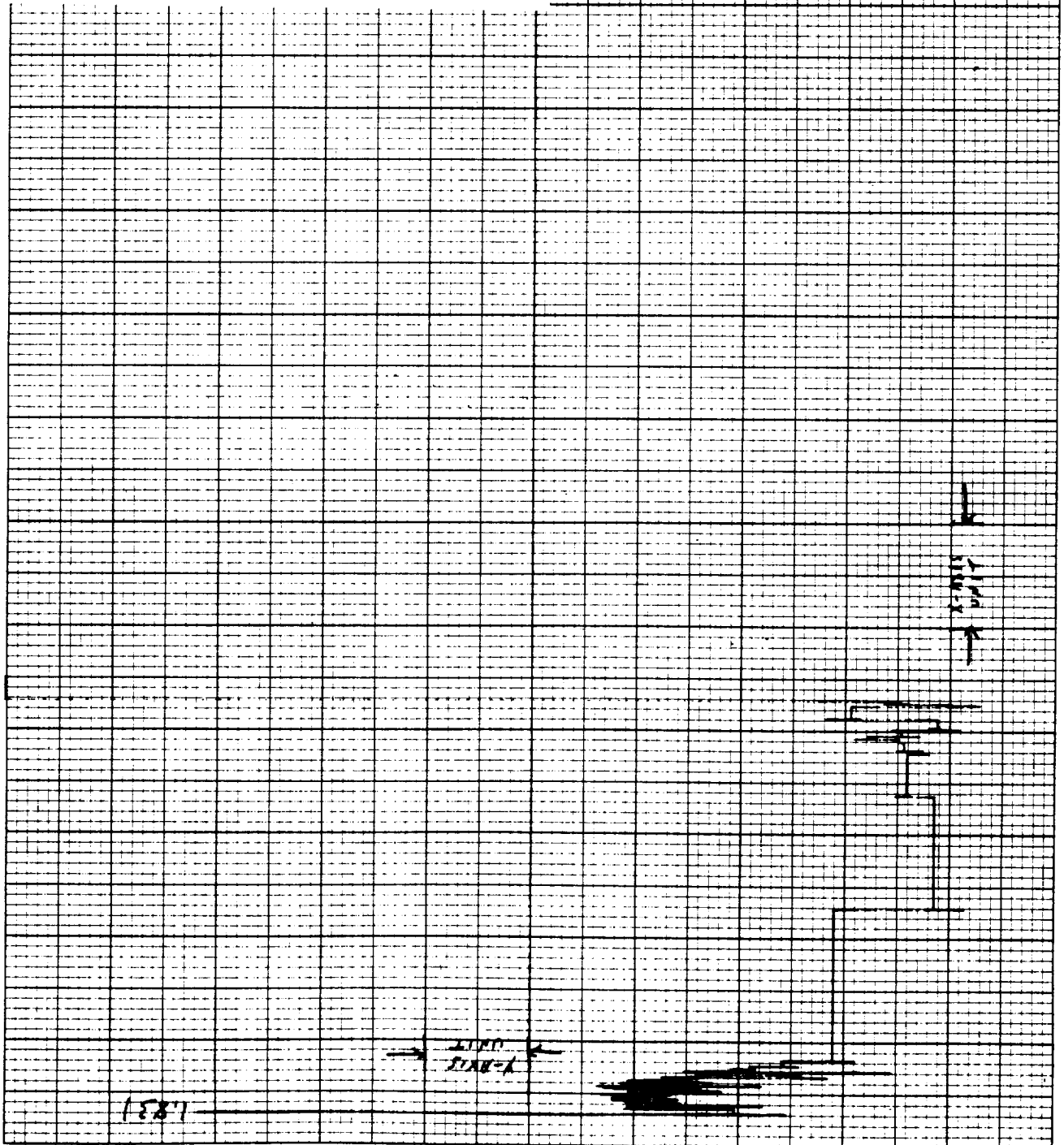
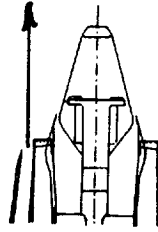
DATE: 6/3/83	NOZZLE: TASS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: G-161	
TRAVERSE DETAILS:	
AXIAL: <input checked="" type="checkbox"/> ; OFFSET - <input checked="" type="checkbox"/>	
RADIAL REF. ( ) - 6.820 VOLTS	R - 1.745
LOCATIONS: TRAVERSE - 5.409 VOLTS	R <sub>2</sub>
RADIAL ( ) : E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS	X
LOCATIONS: TRAVERSE - VOLTS	Deg
SCALE: X-AXIS = 7.20 INCH/UNIT	
Y-AXIS = 370 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



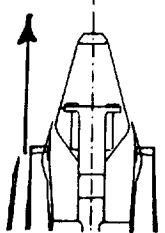
DATE: 6/23/63	WZLE: THS-16
TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: 6-162	
TRAVERSE DETAILS:	
AXIAL <input checked="" type="checkbox"/> : $\phi$ - <input type="checkbox"/> : OFFSET - $\pi$	
RADIAL REF. (C) 6.820 VOLTS	R <sub>1</sub> - 7.46
LOCATIONS: TRAVERSE - 5409 VOLTS	R <sub>2</sub> -
RADIAL <input type="checkbox"/> : E.M. - <input type="checkbox"/> : N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) -	VOLTS: $\frac{1}{5}$ -
LOCATIONS: TRAVERSE -	VOLTS: $\frac{1}{5}$ -
SCALE: X-AXIS= 7.20 INCH/UNIT	
Y-AXIS= 390 P.P.S./UNIT	
HISTOGRAMS: H- TO H-	



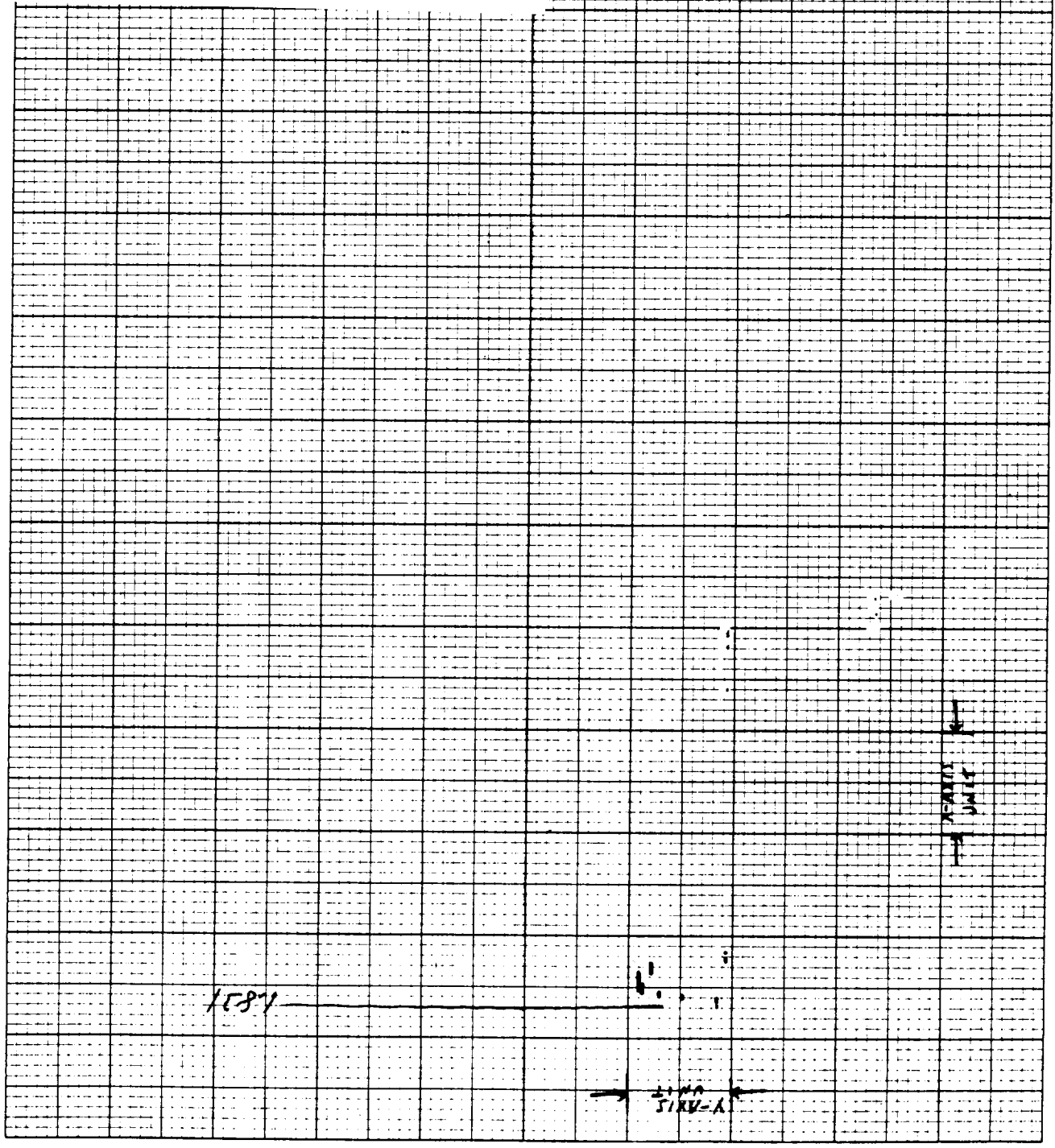
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TEST POINT: L.V. - 4	ACOUSTIC - 1640
PLOT IDENTIFICATION: 6-163	
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RADIAL REF. (C) - 6.820 VOLTS <sub>R</sub> - 24	
LOCATIONS: TRAVERSE - 8.649 VOLTS <sub>R</sub> 2	
RADIAL <input type="checkbox"/> ; E.W. - <input type="checkbox"/> ; N.S. - <input type="checkbox"/>	
AXIAL REF. ( ) - VOLTS <sub>X</sub>	
LOCATIONS: TRAVERSE - VOLTS <sub>deg</sub>	
SCALE: X-AXIS= 7.20 INCH/UNIT	
Y-AXIS= 390 F.P.S./UNIT	
HISTOGRAMS: H- TO H-	



DATE: **6/3/83** NOZZLE: **TAs-16**  
 TEST POINT: **L.V. - 4** ; ACOUSTIC - **1640**  
 PLOT IDENTIFICATION: **G - 164**  
 TRAVERSE DETAILS:  
 AXIAL ☒ : ☐ ; OFFSET - ☒  
 RADIAL REF. ( ) : **6.820** VOLTS  $R_2 = .94$   
 LOCATIONS: TRAVERSE: **8.609** VOLTS  $R_2$   
 RADIAL : E.W. - ☐ ; N.S. - ☐  
 AXIAL REF. ( ) : VOLTS  $X =$   
 LOCATIONS: TRAVERSE : VOLTS  $D =$  eq  
 SCALE : X-AXIS = **7.20** INCH/UNIT  
 Y-AXIS = **390** F.P.S./UNIT  
 HISTOGRAMS: H- TO H-



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## 6.0 SUPPRESSOR BASE PRESSURE DATA WITH AND WITHOUT THERMAL ACOUSTIC SHIELD

In order to assess the influence of the shield stream on the suppressor base pressure and hence the nozzle thrust coefficient, eight (8) static pressure taps as shown pictorially in Figures 6.1 and 6.2 are installed at several wall locations. Base pressure data obtained with each of the probes were recorded during each of the acoustic test points of TAS-15 through TAS-18. These measurements have been used for the estimation of a representative pressure reading within the projected area of one chute from which the change in the outer nozzle thrust coefficient due to suppressor base drag was calculated. Comparison of the calculated base drag data of TAS-18, TAS-16 and TAS-17 (180° shielded suppressor configurations operating at  $V^S/V^O \approx 0.48, 0.64$  and  $0.83$  for a typical takeoff condition, respectively with those of TAS-15 (baseline suppressor nozzle without a shield) is expected to indicate the dependence of suppressor base drag on the shield-to-outer stream velocity ratio.

In this section, the measured base pressure data are tabulated and the method employed to calculate the thrust loss is described. Finally, the thrust loss data so calculated with and without the shields, and under static and simulated flight conditions are presented.

### 6.1 Thrust Loss Calculation Procedure

The location of the eight static pressure instrumentation in the chute region of 20-shallow-chute suppressor nozzle is defined in Figure 6.3. The projected base area of each of the chutes is divided suitably into eight element areas,  $A^k$  defined as per Table 6-I, each of which is associated with a static pressure probe. The static pressure data measured by each of the taps for a given nozzle condition is assumed constant over its associated area.

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Convergent Nozzle  
Inner Flowpath

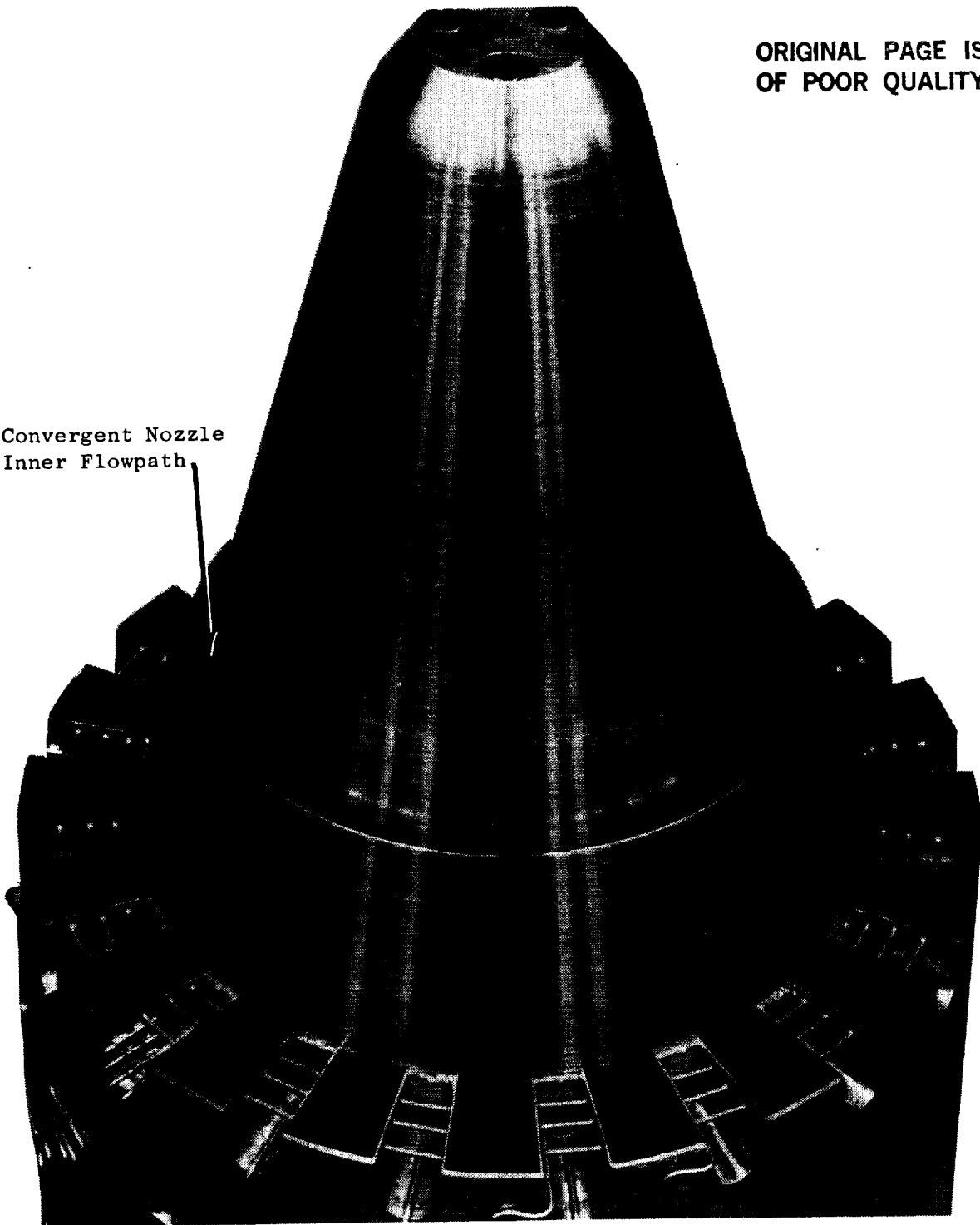


Figure 6.1. A Closeup View of the 20-Shallow-Chute Mechanical  
Suppressor With Fixed Base Pressure Instrumentation.



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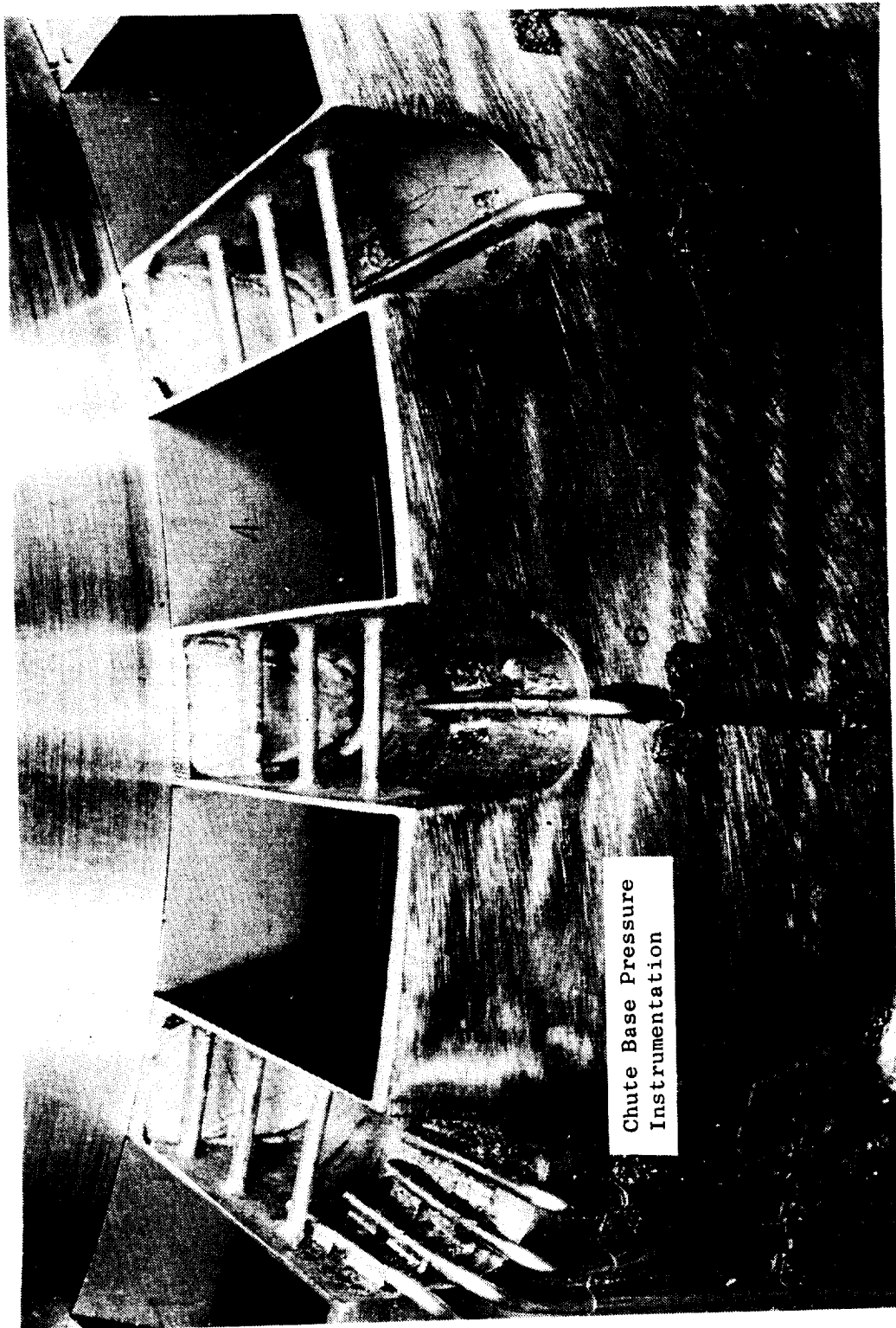


Figure 6.2. Enlarged View of the Chutes of the 20-Shallow-Chute Mechanical Suppressor  
Nozzle Showing Details of the Fixed Static Pressure Probes in the Chutes.

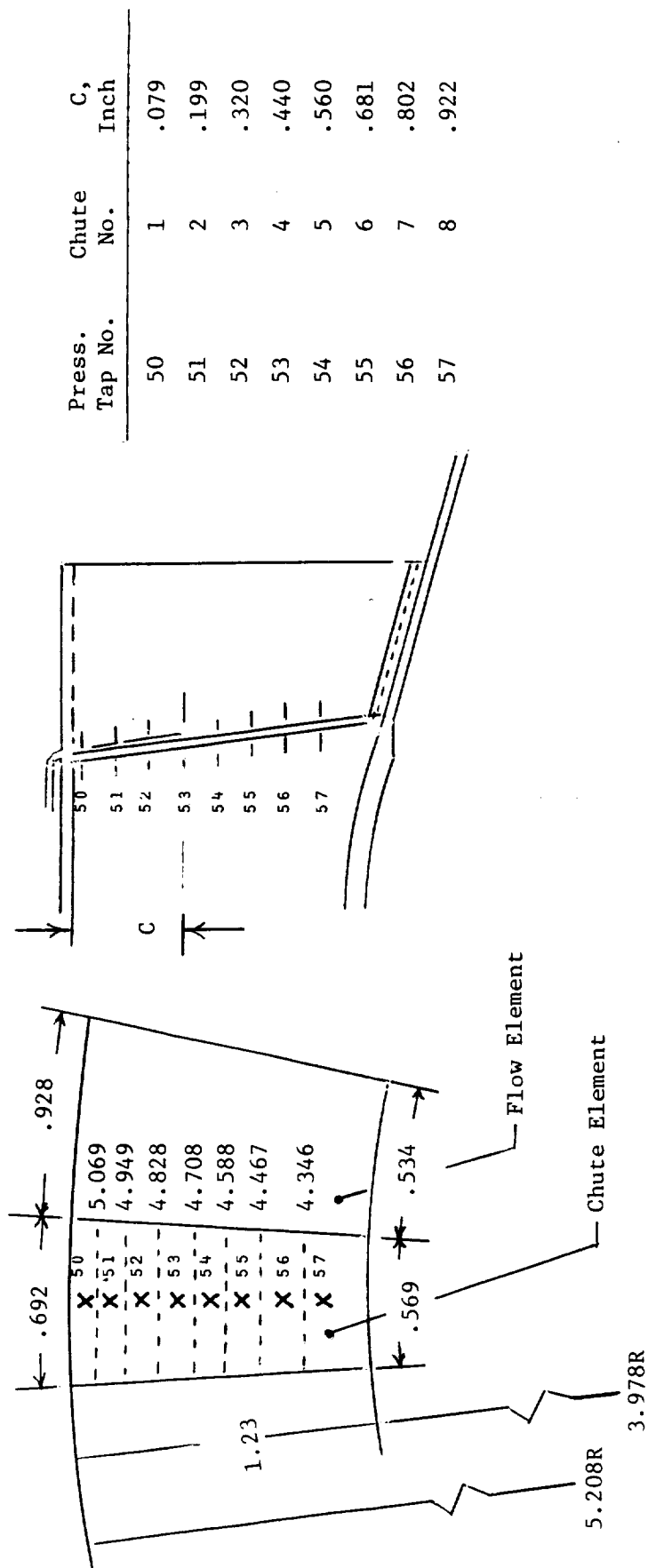
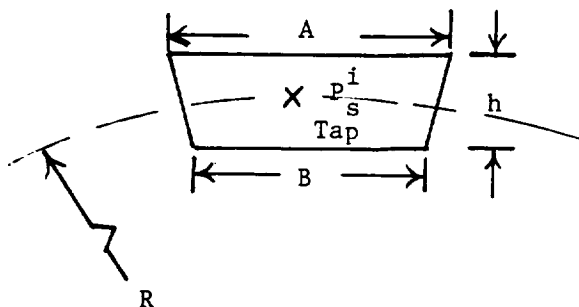


Figure 6.3. Location of Fixed Static Pressure Probes in the Chutes of 20-Shallow-Chute Suppressor Nozzle.

Table 6-I. Chute Base Area Associated with Base Pressure Instrumentation



Designation, i	R	A	B	h	Element ( $A^i$ ) Area, $\text{In}^2$	$A^i/A^T$
Tip	5.208					
#50	5.129	0.692	0.678	0.139	0.0952	0.1227
#51	5.009	0.678	0.666	0.120	0.0806	0.1039
#52	4.888	0.666	0.654	0.121	0.0799	0.1030
#53	4.768	0.654	0.642	0.120	0.0778	0.1003
#54	4.648	0.642	0.630	0.120	0.0763	0.0984
#55	4.527	0.630	0.618	0.121	0.0755	0.0973
#56	4.406	0.618	0.606	0.121	0.0741	0.0955
#57	4.286	0.606	0.569	0.368	0.2162	0.2790
Hub	3.978					
Total $A^T$ =					0.7756	1.000

An area weighted chute average base pressure ( $\bar{P}_S$ ) is calculated from the measured eight static pressures  $P_S^k$  for each of the test conditions using the following equation:

$$\bar{P}_S = \frac{\sum P_S^k A^k}{\sum A} \quad 6.1.1$$

The base drag,  $F_D^{\text{chute}}$  associated with each of the chutes is calculated then as follows:

$$F_D^{\text{chute}} = (P_{\text{amb}} - \bar{P}_S) \sum A^k \quad 6.1.2$$

The total base drag  $F_D$  of the 20-shallow chute suppressor nozzle (TAS-15) is given by

$$(F_D)_{\text{TAS-15}} = 20 F_D^{\text{chute}} \quad 6.1.3$$

For the 180° partial shielded configurations TAS-16, TAS-17 and TAS-18, the base pressure measurements are made on the shielded side only. On the unshielded side, the base pressure are assumed to be the same as *with*

Configuration TAS-15 for identical test conditions. The total base drag for the shielded configurations is calculated then as follows:

$$(F_D)_{\text{TAS-16}} = 10 (F_D)^{\text{chute}}_{\text{TAS-16}} + 10 (F_D)^{\text{chute}}_{\text{TAS-15}} \quad 6.1.4$$

$$(F_D)_{\text{TAS-17}} = 10 (F_D)^{\text{chute}}_{\text{TAS-17}} + 10 (F_D)^{\text{chute}}_{\text{TAS-15}}$$

$$(F_D)_{\text{TAS-18}} = 10 (F_D)^{\text{chute}}_{\text{TAS-18}} + 10 (F_D)^{\text{chute}}_{\text{TAS-15}}$$

The ideal thrust of the outer suppressor nozzle is given by

$$F^0 = \frac{W^0 V^0}{g} \quad 6.1.5$$

where  $W^0$  is the weight flow rate through the suppressor and  $V^0$  is the ideally expanded jet velocity at the suppressor exit.

The thrust loss coefficient  $\Delta C_{fg}$  due to the base drag is computed finally as equal to

$$\Delta C_{fg} = F_D / F^0 \times 100 \quad 6.1.6$$

where the base drag  $F_D$  is obtained from Equations 6.1.3 and 6.1.4 for the unshielded and partial shielded configurations, respectively.

## 6.2 Base Pressure Data and Thrust Loss Coefficients

The measured static base pressures and the computed thrust loss coefficients of Configurations TAS-15 through TAS-18 corresponding to the aerodynamic flow conditions presented earlier in Tables 3-VIII through 3-XI are summarized in Tables 6-II through 6-V, respectively.

The base drag  $F_D^{\text{chute}}$  associated with the unshielded suppressor chutes of TAS-15 is presented in Figure 6.4. This figure was employed to interpolate, when necessary, the  $(F_D)^{\text{chute}}$  values of the unshielded side of Configurations TAS-16 through TAS-18 that are needed in Equation (6.1.4).

The computed thrust loss coefficients of this study are tabulated in Tables 6-II through 6-V. The data are plotted as a function of suppressor stream pressure ratio in Figures 6.5 through 6.8 for tested configurations TAS-15 through TAS-18, respectively. Finally, comparison of the shielded ( $V_r \approx 0.48, 64$  and  $0.83$ ) with unshielded ( $V_r = 0.0$ ) 20-shallow-chute thrust loss coefficients under static and simulated flight conditions are presented in Figures 6.9 and 6.10, respectively, to indicate the dependence of suppressor base drag on the shield to suppressor stream velocity ratio.

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Table 6 - II Summary of Chute Base Pressure Measurements and Base Drag Calculations  
for Configuration 7AS-15.

TEST POINT	$P_r^0$	Ideal Suppressor Thrust	$P_{amb}$	$V_{ac}$	$P_{S0}$	$P_{S1}$	$P_{S2}$	$P_{S3}$	$P_{S4}$	$P_{S5}$	$P_{S6}$	$P_{S7}$	$\bar{P}_S$	$(F_D)_{chute}$	Total Base Drag	$\bar{x}_{\Delta C_{Dg}}$
1501	1.926	413	14.467	0	14.092	14.102	14.202	14.140	14.166	14.127	14.190	14.273	14.181	0.219	4.386	1.06
1502	1.978	425	14.238	400	13.005	13.230	13.354	13.413	13.330	13.228	13.317	13.436	13.310	0.719	14.389	3.38
1503	2.116	482	14.466	0	14.072	14.057	14.184	14.120	14.140	14.099	14.154	14.262	14.158	0.238	4.765	0.99
1504	2.122	475	14.226	400	12.918	13.136	13.288	13.379	13.316	13.205	13.289	13.387	13.260	0.749	14.99	3.15
1505	2.330	559	14.471	0	13.980	13.976	14.122	14.077	14.108	14.043	14.128	14.255	14.115	0.276	5.623	0.99
1506	2.428	585	14.206	400	12.804	12.968	13.179	13.280	13.268	13.090	13.263	13.307	13.166	0.807	16.13	2.76
1507	2.688	691	14.460	0	13.942	13.887	14.053	14.035	14.054	13.991	14.114	14.229	14.071	0.302	6.042	0.87
1508	2.747	701	14.209	400	12.725	12.851	13.070	13.241	13.212	13.094	13.177	13.226	13.093	0.865	17.31	2.47
1509	3.029	818	14.459	0	13.909	13.830	13.984	13.980	14.03	13.985	14.087	14.177	14.028	0.334	6.685	0.82
1510	3.087	825	14.200	400	12.681	12.758	12.985	13.164	13.140	13.073	13.047	13.148	13.02	0.916	18.32	2.22
1511	3.599	1033	14.449	0	13.867	13.822	13.904	13.882	14.026	13.995	14.024	14.149	13.991	0.355	7.105	0.69
1512	3.654	1037	14.217	400	12.718	12.701	12.919	13.033	13.138	13.110	12.934	13.099	12.976	0.962	19.247	1.86
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

$V_{ac}$  is in fps  
 $P_{amb}$ ,  $P_{S0}$  through  $P_{S7}$  and  $\bar{P}_S$  are in psia  
 Ideal Suppressor Thrust,  $(F_D)_{chute}$  and Total Base Drag are in lbs

Table 6-III  
Summary of Chute Base Pressure Measurements and Base Drag Calculations  
for Configuration *TAS-16*

[illegible]

$V_{ac}$  is in fps  
 $P_{amb}$  is p50 through p57 and  $\bar{P}$  are in psia  
 Ideal Suppressor Thrust ( $F_{Dchute}$ ) and Total Base Drag are in lbf

Table 6-IV Summary of Chute Base Pressure Measurements and Base Drag Calculations  
for Configuration TAS-17

TEST POINT	$P_r^0$	Ideal Suppressor Thrust	$P_{amb}$	$V_{ac}$	$P_{S0}^{50}$	$P_{S1}^{51}$	$P_{S2}^{52}$	$P_{S3}^{53}$	$P_{S4}^{54}$	$P_{S5}^{55}$	$P_{S6}^{56}$	$P_{S7}^{57}$	$P_S$	$(F_D)_{chute}$	Total Base Drag	$\Sigma \Delta C_{Fg}$
1703	2.100	470	14.299	0	10.92	11.010	11.215	11.328	11.44	10.812	11.249	11.542	11.247	2.367	26.07	5.55
1704	2.075	459	14.245	400	10.569	10.549	10.592	10.658	11.417	10.922	11.289	11.673	11.074	2.460	32.00	6.97
1705	2.396	576	14.300	0	9.739	9.961	10.195	10.327	10.459	9.394	9.951	10.711	10.198	3.182	34.62	6.01
1706	2.384	570	14.242	400	9.271	9.366	9.502	8.908	10.423	10.133	9.843	11.023	10.01	3.283	40.83	7.16
1707	2.686	682	14.294	0	8.565	8.836	9.030	9.055	9.080	8.664	8.911	9.243	8.974	4.127	44.43	6.52
1708	2.704	687	14.249	400	8.492	8.742	8.861	8.678	←	NO	DATA	→				
1709	3.060	819	14.288	0	7.734	7.691	8.283	8.303	8.323	8.123	8.158	8.272	8.130	4.776	51.11	6.24
1710	3.059	815	14.221	400	7.578	7.573	8.066	7.922	←	NO	DATA	→				
1711	3.593	1018	14.269	0	7.703	7.567	8.397	8.554	8.710	8.554	8.656	8.677	8.391	4.559	49.14	4.83
1712	3.667	1046	14.266	400	7.754	7.689	8.475	8.365	8.781	8.644	8.688	8.732	8.433	4.524	54.85	5.24
1715	3.041	812	14.289	0	7.723	7.701	8.273	8.302	8.331	8.115	8.152	8.273	8.129	4.778	51.10	6.29
1721	3.057	818	14.286	0	7.694	7.666	8.274	8.309	8.344	8.130	8.154	8.273	8.125	4.779	51.13	6.25
1722	3.054	814	14.228	400	7.524	7.573	8.049	7.885	8.081	7.978	7.991	8.073	7.917	4.895	58.13	7.14

$V_{ac}$  is in fps  
 $P_{amb}$ ,  $P_{S0}$  through  $P_{S7}$  and  $P_S$  are in psia  
 Ideal Suppressor Thrust,  $(F_D)_{chute}$  and Total Base Drag are in lbs





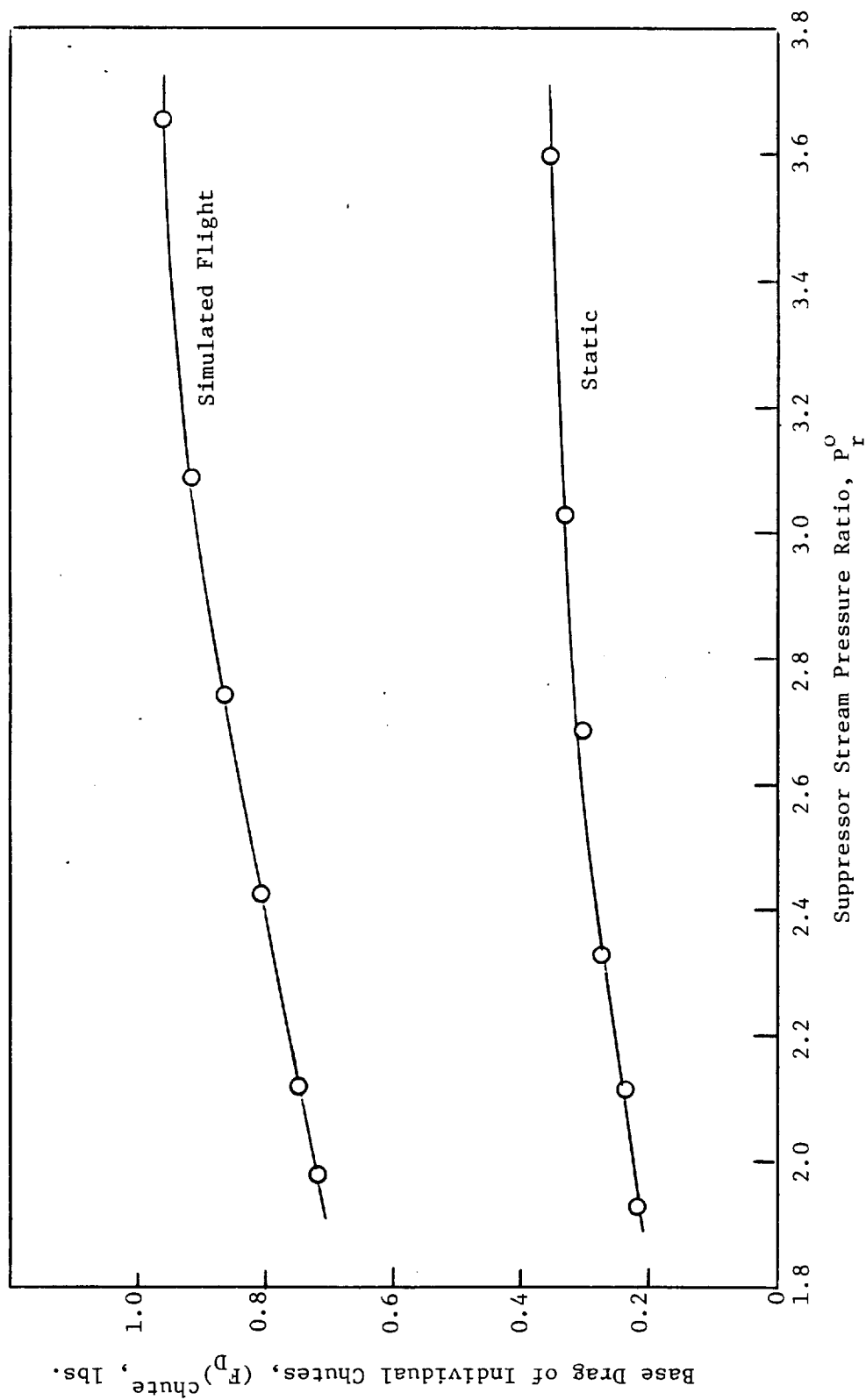


Figure 6.4. Base Drag Associated with Individual Chutes of Unshielded Suppressor Configuration TAS-15.

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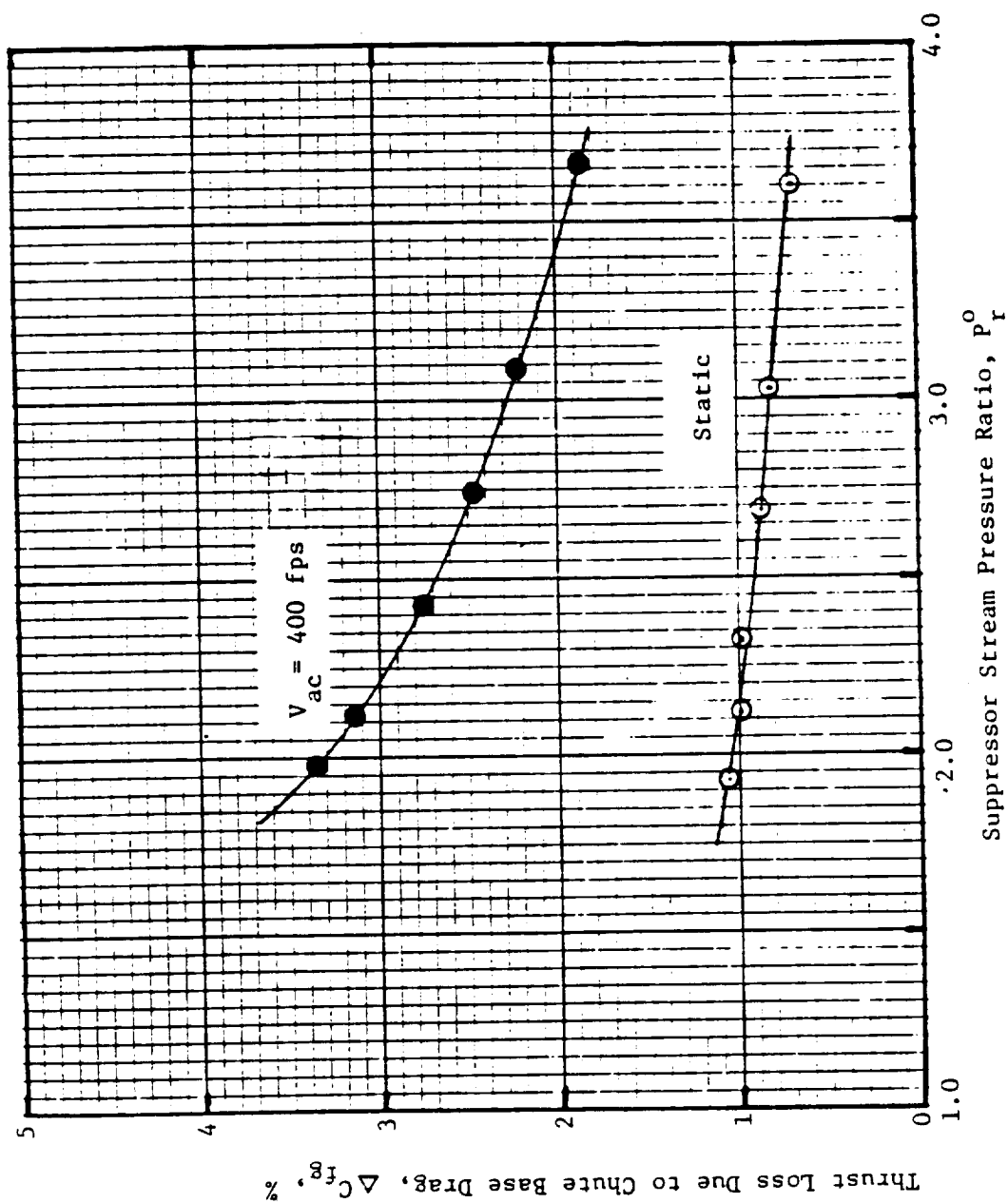


Figure 6.5. Thrust Loss Coefficient Due to Chute Base Drag of Unshielded 20-Shallow-Chute Suppressor (TAS-15).

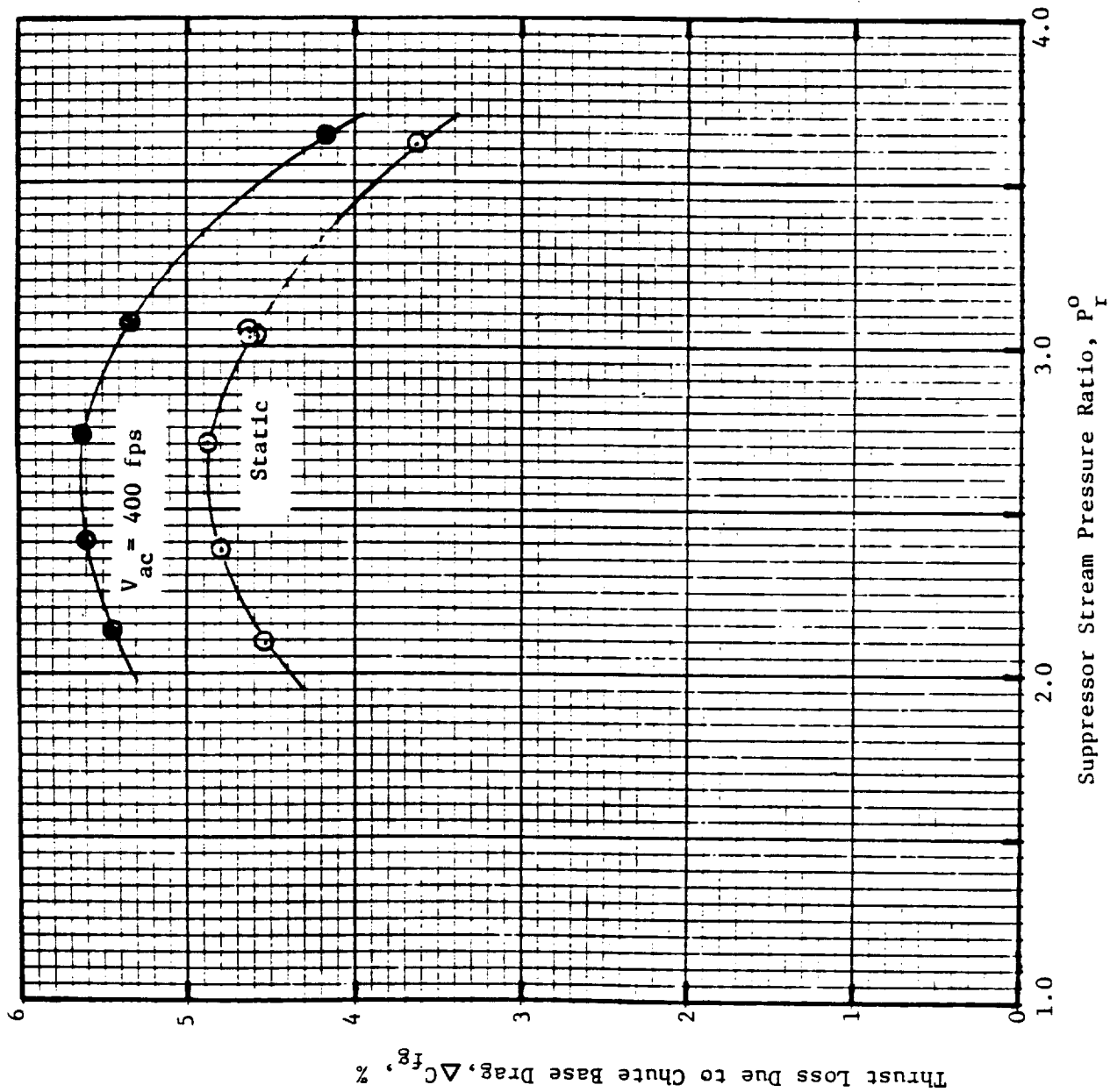


Figure 6.6. Thrust Loss Coefficient Due to Chute Base Drag of  $180^\circ$  Shielded 20-Shallow-Chute Suppressor Operating at Shield to Suppressor Stream Velocity Ratio = 0.64 (TAS-16).

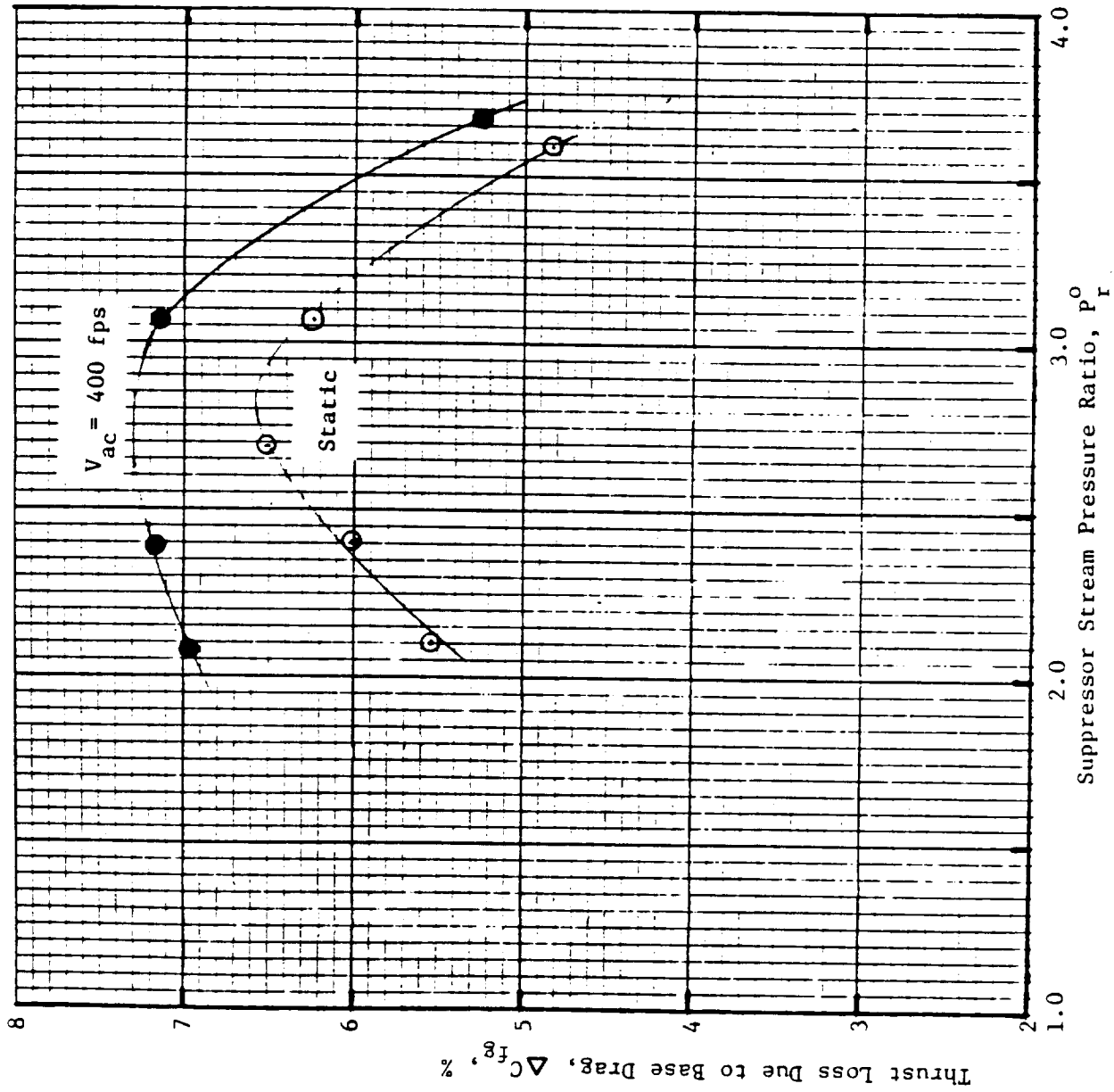


Figure 6.7. Thrust Loss Coefficient Due to Chute Base Drag of  $180^\circ$  Shielded 20-Shallow-Chute Suppressor Operating at Shield to Suppressor Stream Velocity Ratio = 0.83 (TAS-17).

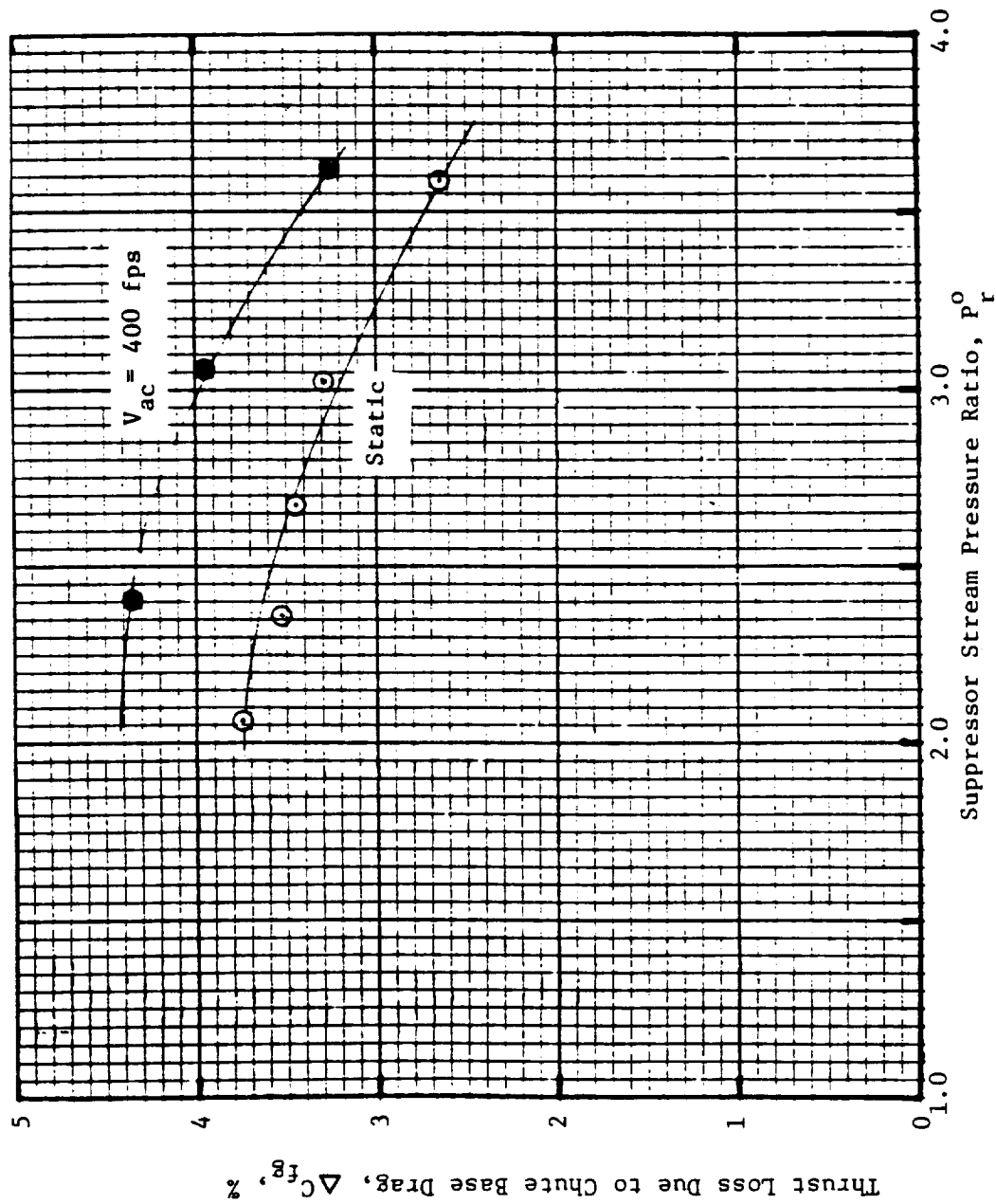


Figure 6.8. Thrust Loss Coefficient Due to Chute Base Drag of  $180^\circ$  Shielded 20-Shallow-Chute Suppressor Operating at Shield to Suppressor Stream Velocity Ratio = 0.48 (TAS-18).

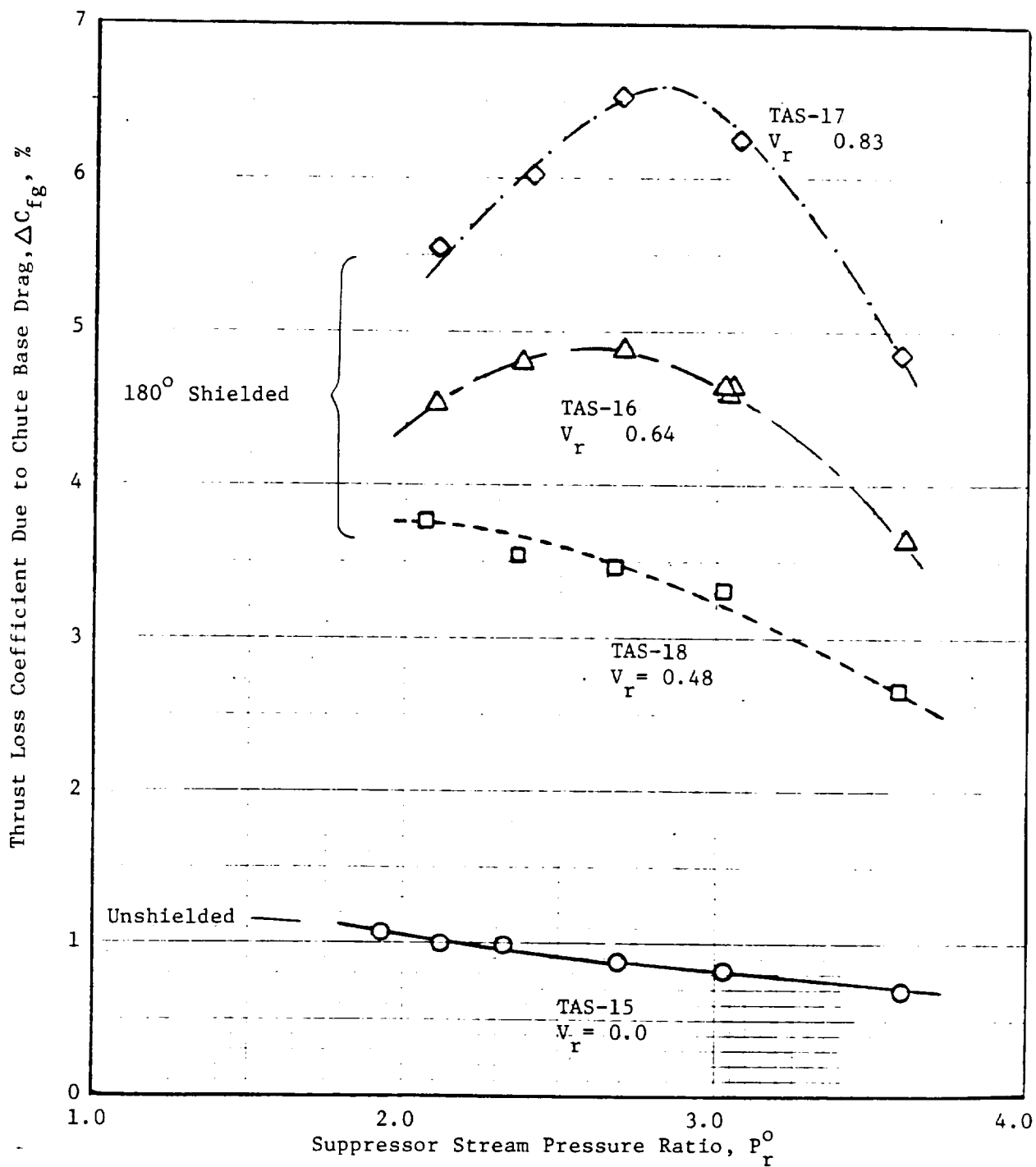


Figure 6.9. Comparison of Static Thrust Loss Coefficient Due to Chute Base Drag of Shielded and Unshielded 20-Shallow-Chute Suppressor.

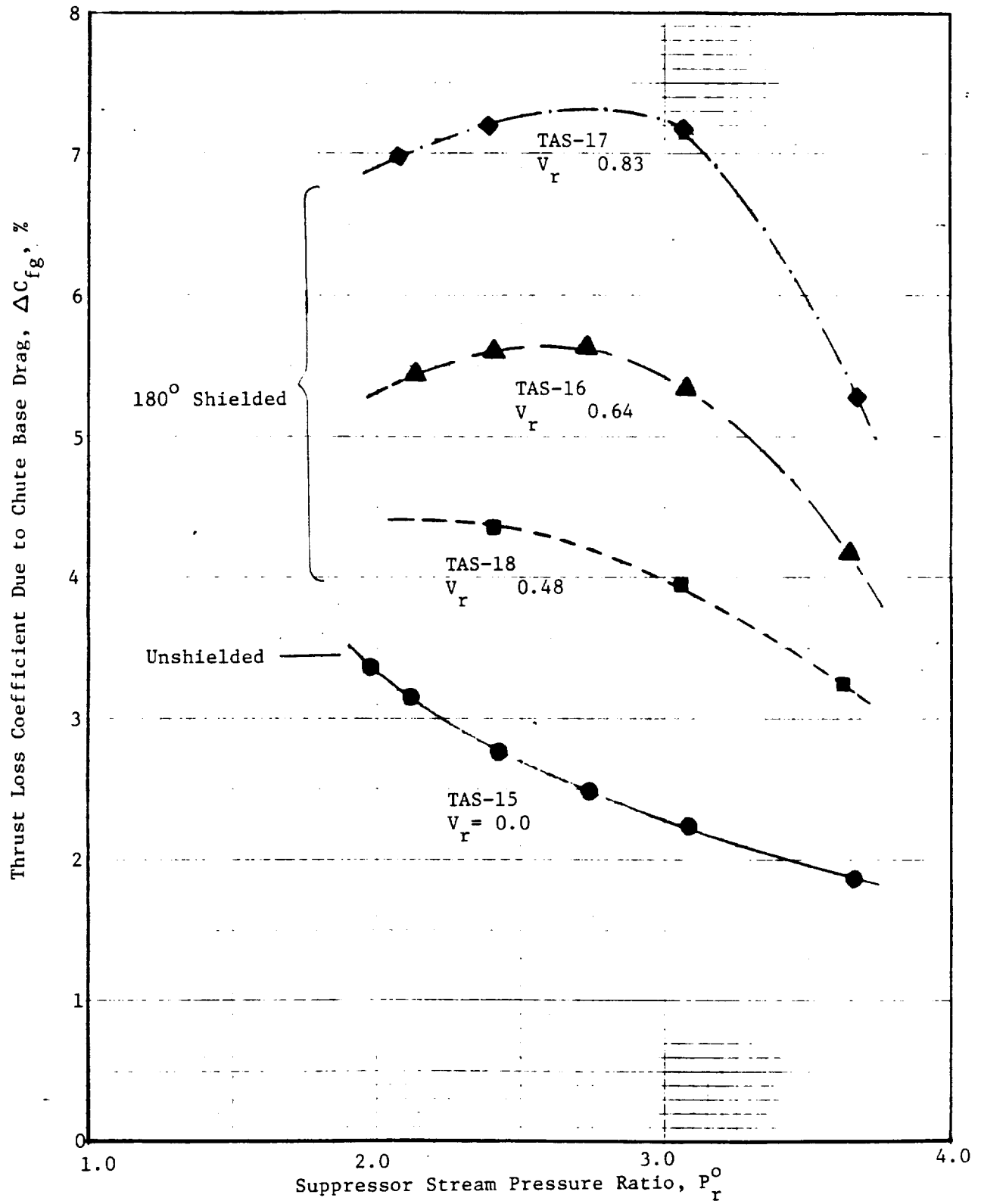


Figure 6.10. Comparison of Simulated Flight Thrust Loss Coefficient Due to Chute Base Drag of Shielded and Unshielded 20-Shallow-Chute Suppressor.



## 7.0 NOMENCLATURE

$\bar{A}$	Throat Plane Physical Area, in <sup>2</sup>
$a_{amb}$	Ambient Speed of Sound
$A_e$	Throat Plane Aerodynamic Area, in <sup>2</sup>
AR	Suppressor Area Ratio, $A_{Annulus}/A_{Flow}$
$A_r$	Area Ratio
AST	Advanced Supersonic Technology
$C_D$	Discharge Coefficient
$d$	Choke Plate Hole Diameter, in
$D_{eq}$	Equivalent Diameter of Throat Plane Physical Area, in
$f$	Frequency
$F$	Thrust
$F_D$	Base Drag
$F_{ref}$	Thrust, 5130 lbs
$h$	Annulus Height at Throat Plane, in
$L$	Choke Plate Thickness, in
LBM	Shock Strength Parameter
LVM	Jet Velocity Parameter
$M$	Mach Number
NF	Normalization Factor
$P_r$	Pressure Ratio
$P_s$	Static Pressure, psia
$P_T$	Total Pressure, psia
PNL	Perceived Noise Level
PNLN	Normalized Perceived Noise Level, PNL + NF
PWL	Sound Power Level, dB Reference 10 <sup>-12</sup> Watts
$R_h$	Flowpath Hub Radius at Throat, in
$R_r$	Radius Ratio
$R_t$	Flowpath Tip Radius at Throat, in
RH	Relative Humidity, %
SABBL	Stratford & Beavers Boundary Layer Computer Program
SPL	Sound Pressure Level
STC	Stream Tube Curvature Computer Program
TAS	Thermal Acoustic Shield

$T_T$	Total Temperature, °R
$\bar{V}$	Mean Velocity
$V$	Fully Expanded Jet Velocity, ft/sec
$V'$	Turbulent Velocity
VCE	Variable Cycle Engine
$V_r$	Velocity Ratio
$W$	Weight Flow, pps
$W_r$	Weight Flow Ratio
$X$	Axial Distance, Shield to Primary Nozzle Exit Plane, in
$\theta$	Angle From Top Vertical Centerline, Aft-Looking-Forward, deg
$\theta_{chute}$	Angle Subtended by Each Chute, deg
$\theta_{flow}$	Angle Subtended by Each Flow Element, deg
$\theta_h$	Flowpath Angle at Hub of Throat, deg
$\theta_i$	Angle of Observer Relative to Inlet Axis
$\theta_t$	Flowpath Angle at Tip of Throat, deg
$\theta_{th}$	Exit Plane Discharge Angle Re Vertical, deg

#### SUPERSCRIPTS

$i$	Inner Stream
mix	Mixed Stream
$o$	Outer Stream
$i,o$	Ratio of Inner to Outer
$s$	Thermal Acoustic Shield Stream
$s,o$	Ratio of Shield to Outer
$T$	Total Flow Area, in <sup>2</sup>

#### SUBSCRIPTS

ac	Aircraft
r	Ratio

4BJ43001